To demonstrate compliance with the dpm rule, the mine operator need only add a filter kit supplied by the equipment manufacturer. Filter kits which have been evaluated for permissibility are available from machine manufacturers for approximately 222 out of the 481 permissible machines that are not already equipped with filters. In the event that a kit is not available for a particular machine, the mine operator may work with the machine manufacturer to adapt an existing kit, or fabricate a special kit. MSHA will expedite the evaluation of field modifications submitted by mine operators to add such kits.

One commenter stated that MSHA has not done enough with its knowledgeable personnel and research facility, and indicated that industry would welcome the opportunity to develop with MSHA research and development programs in the area of dpm filtration. MSHA has worked with NIOSH, labor representatives, and the industry in the past and is committed to continue to work with these groups on projects which promote a safer mining environment. The Diesel Toolbox arose out of just such an effort, as described in part II. But the Agency must also act to require the use of existing technology when it determines that miners are at significant risk of a material impairment to their health.

One concern expressed by the mining community about more extensive reliance upon paper filtration systems is the increased potential for fires if, for example, water scrubbers run dry and the exhaust gases then become hot enough to ignite the paper filters. Several commenters expressed concerns about reports of fires that occurred on permissible diesel powered equipment on which paper particulate filters had been installed. Commenters told of fires on equipment in both western and eastern mines and further stated that the fires were the result of a lack of maintenance. While MSHA is concerned about all fires in underground mines, fires on permissible equipment are of particular concern because that equipment may operate in areas of the mine where methane may be present.

Shortly after particulate filters were introduced, MSHA received reports of a filter fire in an underground mine and at a surface facility of a second mine. In the latter incident, the machine operator was unaware that a filter had been installed and continued to operate the equipment on the surface without water in the water scrubber. After looking into the incidents, MSHA issued a Program Information Bulletin informing the mining community of the importance of maintaining those components of permissible diesel power packages that limit the exhaust gas temperature below 170 degrees Fahrenheit. This PIB, P92–17, was published on October 23, 1992, and was given wide distribution throughout the country.

Until the public hearings on this rule, MSHA was not aware of any additional filter fires. MSHA has no additional information concerning incidents of fires in mines involving permissible diesel equipment with particulate filters. Maintenance personnel at one mine had related that several filters had been exposed to high exhaust gas temperatures and that the filter media had started smoldering. The smoldering had been accompanied by significant amounts of smoke which alerted the equipment operators. The equipment operators removed the filters and extinguished the smoldering material before any actual fire broke out. According to mine maintenance personnel, these incidents had occurred several years ago, and since improved maintenance procedures were established and additional training had been provided, no additional problems had been noted.

MSHA has continued to investigate this matter because of the potential consequences of a filter fire underground. MSHA is aware of a filter media used in Australia for the same application on permissible diesel equipment. The media is called Filtrete and is manufactured by 3M. The media is polypropylene and when exposed to a heat source, the media reportedly melts away rather than burns. Reportedly, the filter media is as effective at removing diesel particulate as the filters currently used on diesels with water scrubber systems. MSHA is in contact with the filter manufacturer, and with Australian mine regulatory authorities, and mine operators concerning their experience with the filters. MSHA has also reviewed the flammability characteristics of the filter media used on dry type permissible diesels. One such media is a fiberglass/polyester fabric which seems to have flammability characteristics similar to the Filtrete media.

As noted by at least one commenter, observing the recent diesel equipment maintenance requirements should minimize the already small potential for any problems. Nevertheless, MSHA will continue to look at alternative media, if for no other reason that to ascertain if they perform better than paper filters in removing dpm from the engine emissions.

Although operators can comply with this requirement by using a paper filter, MSHA would like to encourage the introduction of cleaner engines in permissible equipment. The rule does not deal directly with factors which may be discouraging operators from using engines which incorporate the latest technologies to reduce dpm emissions. In order for an engine to be used in underground coal mines in permissible equipment, the engine has to be approved by MSHA for permissible applications, and this process operates at the initiative of engine manufacturers rather than mine operators. MSHA notes that even though engine manufacturers are producing significantly cleaner diesel engines, engine manufacturers have not submitted applications to MSHA to have these newer engines approved for permissible applications prior to this final rule. There are 528 permissible diesel powered machines in underground coal mines. The majority of the permissible machines use the Caterpillar 3306 PCNA, Caterpillar 3304 PCNA, or the Deutz-MWM 916–6 diesel engines as stated previously. These engines are of older technology design and produce almost 10 times the dpm emissions as modern engines. However, due to the costs of obtaining approval of an engine for permissible applications, which are borne by the applicant, and low sales volumes in underground coal for permissible machines, engine manufacturers are understandably reluctant to submit new technology engines for approval as permissible.

MSHA is developing programs that would facilitate the availability of engines that utilize the latest technologies to reduce gaseous and particulate emissions for use in permissible equipment. Current engine designs that utilize low emissions technologies are currently approved by MSHA in nonpermissible form. Particulate emissions are currently being determined by third parties testing under 30 CFR, Part 7. MSHA is in the process of purchasing an engine particulate testing system. Once this system is installed, MSHA will be able to facilitate testing and defer some of the cost of diesel engine particulate emission testing at its Approval and Testing Center. MSHA is considering a number of other programs that could aid the industry with emission tests.

One of the programs that MSHA is considering would follow the precedent established in the recently published diesel equipment rule. To facilitate compliance with this dpm rule, MSHA is considering funding the additional emissions testing needed to gain approval as permissible, certain

previously approved, non-permissible engines that utilize low emissions technology engines. Additionally, MSHA is considering waiving the normal fees that the Agency charges for the administrative and technical evaluation portion of the approval process.

Alternatively, MSHA may relax, as an interim measure, the requirement that engine approvals be issued only to engine manufacturers. This requirement, stated in part 7, is intended to ensure that the party to whom the engine approval is granted has the ability to ensure that the engine is manufactured in the approved configuration. MSHA is considering a program in which an equipment manufacturer may utilize an engine, approved by MSHA as nonpermissible, in a permissible power package. MSHA would ensure that the additional emissions tests required for permissible engines are conducted as part of the power package approval process. The use of an engine previously approved as nonpermissible is a critical element of the program. For those engines, the engine manufacturer has already made the commitment to manufacture the engine in an approved configuration. The permissible configuration would be the same as the nonpermissible configuration. Provisions of the two programs could be combined. MSHA will solicit input from the mining community as it continues to develop these program concepts.

In response to comments, MSHA also took another look at the other components added to diesel engines of permissible equipment. One such control on permissible equipment is the device used to cool the hot gases emitted by diesel engines to the temperatures required for permissible applications. Specifically, in order to use a paper filter, a means of cooling the exhaust gas must be installed upstream of the paper filter to reduce the exhaust temperature below the ignition temperature of filter media. This is accomplished on permissible machines with either a water scrubber or a heat exchanger. The water scrubber allows the water to contact the exhaust, thus cooling the exhaust to less than 170° F. The heat exchanger cools without direct contact between water and the exhaust, thus providing a dryer exhaust. Research conducted by others has shown that water scrubbers can lower dpm concentrations by 20–30%. The Southwest verification showed that a heat exchanger can remove approximately 9% of the dpm. Either cooling method would reduce dpm to some degree; however MSHA is confident, and the SwRI tests clearly showed, that the majority of the filtering comes from the paper filter.

One commenter asserted that the most important emissions control that could be placed on a piece of diesel equipment is a catalytic converter. While there is some evidence in the record suggesting that OCCs can remove up to 20% of dpm emissions, this commenter's assertions about the importance of this control appear to stem from the view that the hazards to miners from diesel emissions come primarily from diesel gases rather than the particulate emissions. As indicated in MSHA's risk assessment, the risks which MSHA is acting to prevent in this case are from particulate emissions. Catalytic converters alone could not reduce dpm emissions from permissible equipment to levels that MSHA deems necessary.

Time frames for implementation. Commenters were also concerned that the 18-month time frame established in the proposed rule to bring existing fleets into compliance would not be feasible.

In part, these concerns stemmed from technological feasibility—that controls did not yet exist which would be available by the required time. Also, these concerns related to economic feasibility. As noted above, some commenters thought they would have to replace wet systems with a dry system package in order to comply with the proposed rule; such a changeover would be expensive and, given the amount of work involved, take time. Others were concerned about the availability of filtration systems that would fit existing systems and the time necessary to develop or rig systems to fit on a variety of existing machines underground.

The evidence discussed above addresses these concerns. MSHA is not pushing technology with the proposed emissions limit; rather, the technology is already here and for many pieces of equipment already in kit form for ready installation. The costs to the industry as a whole of adding paper filter to the permissible fleet after 18 months are economically feasible as well.

Moreover, the final rule requires that a permissible piece of equipment being ''introduced'' underground for the first time 60 days after this rule is promulgated will have to be so equipped.

MSHA means by ''introduced'' any equipment added to the mine's diesel equipment inventory. That inventory, and any changes to it, must be recorded by an operator as a result of this rulemaking and be maintained pursuant to new 30 CFR 72.520. ''Introduced'' means newly purchased equipment, used equipment, or a piece of equipment receiving a replacement engine with a different serial number than the engine it is replacing, including engines or equipment coming from one mine into another. It does not include a piece of equipment whose engine was previously part of the mine's inventory and rebuilt.

As a result of the information discussed above, MSHA has determined that this requirement is both technologically and economically feasible to require any newly introduced equipment to have the filter in place (see MSHA's REA for additional information). MSHA recognizes that in some areas, longwall moving equipment may be shared among mines, and that in one or two cases a scheduled longwall move could be impacted by this effective date; however, MSHA has concluded that by working with machine manufacturers, operators who find themselves in such a situation can avoid any disruptions.

72.501 Emission Limits for Nonpermissible Heavy Duty Diesel Powered Equipment, Generators, and Compressors

Organization. MSHA proposed limits on the dpm emitted by nonpermissible heavy-duty vehicles as part of 30 CFR 72.500, but in the final rule MSHA moved these requirements to a new 30 CFR 72.501. Also, this section now contains requirements for two types of light-duty equipment whose operating characteristics produce large quantities of dpm.

Summary of final rule. In the final rule, MSHA has adopted a machine emission limit for heavy duty diesel powered equipment, as defined by § 75.1908(a), just as it is doing with permissible equipment pursuant to § 72.500 of this final rule. It also applies this limit to generators and compressors.

Paragraph (a) specifies a machine emission limit for dpm at 5.0 gm/hr for heavy-duty equipment, generators or compressors introduced into an underground area of an underground coal mine more than 60 days after the date of publication of this final rule. ''Introduced'' means any equipment added to the mine's diesel equipment inventory.

Paragraph (b) provides that the fleet of such equipment already in a mine must reach a machine emission limit for dpm at 5.0 gm/hr within 30 months.

Paragraph (c) provides that the emission limit for all such equipment is further reduced to 2.5 gm/hr after 4 years.

Paragraph (d) exempts from the requirements of the rule any generator

or compressor that discharges its exhaust directly into intake air that is coursed directly into a return air course, or discharges its exhaust directly into a return air course.

Why dpm emissions from heavy-duty equipment, generators and compressors need to be controlled.

As discussed in connection with § 72.500, MSHA determined that it could not establish a dpm concentration limit for underground coal mines, and therefore needed to focus its attention on the control of dpm emissions from specific types of equipment.

The preamble accompanying the proposed rule also explained why the agency was proposing to limit the emissions from heavy-duty equipment in particular. MSHA discussed earlier in the permissible section that engines used in permissible equipment generated large quantities of dpm. Many pieces of heavy-duty equipment utilize the same engines as permissible equipment and consequently produce similar high levels of dpm. MSHA closely examined the dpm emission rates from engines used in other heavy-duty equipment and found them to be as high as those rates found in permissible equipment. Furthermore, heavy-duty equipment is used in areas of the mine where the ventilation quantities may be less than those provided where permissible equipment is used. Equipment that moves long wall components is known to work at a high duty cycle, in close proximity to miners, and in areas of the mine where there are frequent ventilation interruptions. Numerous commenters stated that diesel emissions continue to be the cause of air quality problems during long wall moves. Even though newer engines are being added to the heavy duty fleet, additional controls are needed to further reduce the dpm levels to which miners are exposed. As shown in table IV–1, engines like the Deutz BF4M1012EC rated at 113hp and the Detroit Diesel Series 40 DDEC rated at 230 horsepower are low emission engines that have been designed to meet current EPA standards. However, the gm/hr levels are still higher than the MSHA standards and would require aftertreatment controls.

The proposed rule did not cover generators and compressors. However, the extension of the heavy duty requirements to generators and compressors stems directly from a question MSHA placed before the mining community. In reviewing alternative approaches considered by the Agency, the preamble of the proposed rule (63 FR 17564) noted that light-duty equipment does contribute to the total particulate concentration in underground coal mines, and explored the possibility of requiring light-duty equipment to be treated like permissible and heavy-duty equipment. The agency noted that it had tentatively concluded that requiring controls for the whole light duty fleet may not be feasible for the underground coal sector at this time. In this regard, it should be noted that light-duty equipment in underground coal mines makes up approximately ⅔ of the whole fleet: 2,030 engines out of the total MSHA inventory of 3121.

The Agency stated that it welcomed ''information about light-duty equipment which may be making a particularly significant contribution to dpm emissions in particular mines or particular situations, and which is likely to continue to do so after full implementation of the approval requirements of the diesel equipment rule.'' The Agency went on to say that: ''MSHA will consider including in the final rule filtration requirements that may be necessary to address any such identified problem.'' This discussion was repeated in the section by section review of the proposed rule. (63 FR 17556) The Agency reiterated its request for comments in this regard in its Questions and Answers (Q and A #10, 63 FR 17499).

As discussed below, based on the record, MSHA has concluded that generators and compressors, while considered light-duty equipment for purposes of the diesel equipment rule, in fact have operating characteristics that produce large quantities of dpm, and should be controlled in the same manner as heavy-duty equipment.

Numerous commenters spoke on the issue of whether light-duty equipment, as defined by the diesel equipment rule, should be subject to dpm emissions standards. However, the record is divided between those who asserted that this type of equipment really operates much like heavy-duty equipment—*i.e.,* works many hours during a shift at high loads—and those who asserted that the equipment is normally used at low loads and very little during the day. Very limited data was provided by proponents of either position; not enough for MSHA to make a clear determination of which position to adopt when looking at light-duty equipment as a whole.

Based on the record, MSHA believes that light-duty equipment is used in a variety of ways dependent on individual mine situations. The engine loading dependent on mine conditions can play an important role in the emissions from the diesel. Two different mining conditions with identical equipment could experience vastly different emission levels from these engines due to the engine load that must be produced to complete the work. Therefore the commenters may be correct for their individual mines where the light-duty equipment must work at higher engine loads to complete the work. However, other miners with identical equipment may not experience the same degree of engine load which could result in lower levels of exhaust emissions.

However, the situation becomes much clearer when the focus narrows to specific types of light-duty equipment. For example, one commenter noted that some light-duty equipment (such as air compressors) which was exempt from requirements in the proposed rule, emitted high levels of dpm as determined by emission analyzers. Another commenter stated that larger engines that have heavy duty loads produce more dpm per hour and should be controlled. The commenter specifically recommended an OCC, adequate ventilation, and soot (dpm) filters.

After a review of the information available, MSHA has concluded that air compressors and generators emit more dpm in the mine environment than other light-duty equipment because their engines are operated continuously under high-load conditions when they are running. Generators are designed to run under a loaded condition to produce electricity and air compressors work at full load to produce compressed air. In both cases, these engines are operating at a high load, which contributes to high dpm emissions. Based on the information provided by a commenter that the gaseous emissions levels from air compressors were high, this would correlate with high engine load and also would be related to higher dpm emissions. In addition, generators and compressors can use very large horsepower engines, *i.e.* above 200 horsepower; by comparison, permissible equipment generally does not exceed 150 horsepower. In fact, some of the highest horsepower engines in underground coal mines are in generators and compressors. For example, in Table IV–1 engines that are known to be used in generators and compressors are represented by approval numbers B018, B037, and B036 and have horsepower ratings of 500, 275, and 220, respectively. Accordingly, in the final rule MSHA requires that air compressors and the generators meet the same engine emission limits as established for heavy-duty equipment. MSHA's inventory indicates that there are 66 air

compressors and generators out of a total of 3,121 pieces of diesel-powered equipment in underground coal mines—about 3% of the 2,096 light duty units.

Why the final rule uses a machine-based emission limit instead of requiring for a high-efficiency filtration system.

The proposed rule would have required mine operators by 30 months from the date of publication of the final rule to install, on nonpermissible heavy-duty vehicles, a system capable of removing, on average, at least 95% of dpm by mass.

The use of a machine emissions limit in the final rule stems directly from an alternative which MSHA placed before the mining community in the preamble to the filter-efficiency based proposed rule. In that preamble, the Agency requested comment on an alternative approach that would establish a machine based limit on emissions in lieu of a filter efficiency requirement (see, *e.g.,* 63 FR 17556, 17563). In fact, a separate ''Question and Answer'' was included in the preamble to highlight this alternative, immediately after the description of the proposed rule. 63 FR 17501, 17653. Based on the record, MSHA has concluded that the original proposal had deficiencies (such as a credit for clean engines and a variety of filter efficiencies) which are avoided by the alternative approach.

As explained in connection with § 72.500, based on the record developed, the Agency concluded that a machine based emissions limit avoids a number of problems with the approach initially proposed. The explanation provided in that discussion as to (1) why MSHA moved to a machine based emissions limit for permissible equipment; (2) why it decided not to make adjustments for ventilation or permit an exemption for enclosed cabs; and (3) the flexibility in choice of controls provided to operators, is fully applicable for heavy-duty equipment, and accordingly is not repeated.

Why MSHA concluded that the emissions limit for heavy-duty equipment, generators and compressors should ultimately be 2.5 grams per hour. As with permissible equipment, the emissions limit for this type of equipment was determined with reference to technological and economic feasibility. As is evident from the final rule, the emissions limit is 2.5 grams/hour, the same as the permissible limit; and, like permissible equipment, 2.5 grams/hour represents a 95% reduction in the dpm emissions of the engine that produced the most dpm emission in this category.

MSHA wishes to emphasize that despite this fact, the limit in the final rule was not merely a determination to use the proposed rule in another form, or to have an equivalency between permissible equipment and this equipment. Rather, once MSHA decided to use an emissions limit approach, it reviewed the record to determine what could feasibly be achieved with the controls available for this type of equipment. Instead of using paper filters as with permissible equipment, this kind of equipment would generally be filtered by ceramic or other hot gas filters—or systems that lower the temperature of the emissions so that paper filters can be used. Ceramic filters cost more than paper filters, require regeneration, and have certain other associated costs. On the other hand, unlike the permissible fleet, the fleet of heavy-duty equipment, generators and compressors has many choices of approved engines available for use, many of them modern technology engines with significantly lower emission rates than the engines currently utilized in this equipment.

Table IV–1 shows the current dpm emissions from MSHA's inventory of heavy-duty equipment, generators and compressors based on engine approval data, and shows the filter efficiency required to reduce those emissions to the interim and final limits required by the final rule. Based on information about the current efficiencies of hot gas filters (discussed in the next section), MSHA believes that a significant percentage of the current fleet can immediately meet a limit of 2.5 grams/hour with such filters alone—and all of the current fleet, except equipment powered by the Caterpillar 3306PCTA, can move immediately to meet a limit of 5.0 grams/hour with filters of only that efficiency. And even in the highly unlikely case that filter efficiency does not continue to improve to meet new demands in Europe and for over the road hauling in the United States, operators can bring the remainder of the fleet into compliance with new engines and filters with present day performance capabilities. In fact, the only reason for the two-tiered approach adopted in the final rule is to ensure that implementation of the rule will be economically feasible.

Some commenters stated that the proposed rule is technology forcing and would require manufacturers to conduct approval tests to market new products, although some commenters who made this observation conceded that MSHA had the legal right to force technology. Another commenter stated that all heavy-duty equipment would require heat exchangers or equivalent means to allow for the use of paper filters since these, in the views of that commenter, appear at present to have higher filter efficiencies.

These comments have some credibility with respect to the original proposal, which would in essence have required the engines that produce the most dpm emission in this category to achieve a limit of 2.5 grams/hour with filters alone; although as noted above, there are already some hot gas filters that are approaching this result. However, the machine emission limits set forth in this section are clearly feasible with current technology, as cleaner, approved nonpermissible engines are available should a piece of equipment not be able to reduce dpm to the required limit with filter alone.

A number of commenters argued that MSHA should not establish a rule which might rely heavily on the availability of ceramic filters because such systems have not performed well from either a practical or efficiency standpoint. MSHA has been aware that in many cases the industry, especially the metal/nonmetal mining sector, has had problems with the use of ceramic filters. However, these problems were reported over 10 years ago when the ceramic filter technology was originally being developed for the on-highway truck engines. When the highway truck sector did not need ceramic traps to comply with the on-highway EPA regulations, significant work on these trap systems was abandoned for the on-highway sector.

More recently, the European directive requiring filters on diesels in confined areas, Canadian mines research with dpm filters, and the continued US efforts to reduce dpm emissions in the environment, have led filter manufacturers to improve the performance and reliability of ceramic filters. Some M/NM mines have reported favorably on the use of ceramic traps. Aftertreatment control vendors, mine operators and VERT have reported filter life of over 8000 hours. After a review of the information in the record in this regard, as was described in more detail in section 6 of Part II, MSHA has concluded that the more recent work with ceramic traps has shown they are feasible for use by the underground coal mining industry.

How the mining community can go about implementing this requirement, and how MSHA can help. While the rule provides flexibility of controls to reach the required limit (controls that reduce engine emissions, that is), most operators are going to utilize hot gas (ceramic) filters to comply. In some

cases, however, installation of a cleaner engine or the DST® or similar modified dry system (one without the permissibility components) may be more cost effective, and will be permitted under this machine based rule. Therefore to determine whether a particular machine is in compliance, MSHA will generally need to know the emissions from the engine in the equipment and the filtration efficiency of the filter.

The dpm emission rate of an engine will be established by the dpm concentration determined during the engine approval process. The engine baseline dpm data for each MSHA approved non-permissible engine will be posted on the MSHA homepage at http://www.msha.gov/S&HINFO/DESLREG/1909a.HTM.

Unlike the situation at present with permissible engines, in which none of the cleaner technology engines manufactured in recent years has been submitted for approval for permissible use, engine manufacturers have been submitting applications for approval of nonpermissible engines which meet EPA standards for both on road and nonroad applications. Thus, mine operators have the option of significantly reducing dpm emissions from heavy-duty equipment, generators and compressors by switching to cleaner approved engines. Moreover, MSHA is planning to accelerate the process of approving such engines so as to ensure that equipment of all sizes and shapes can utilize the cleanest engines available.

MSHA is developing a program which will streamline the procedures by which manufacturers of diesel engines intended for use in outby areas of underground coal mines can gain Agency approval. The program will draw on the EPA approval programs for engines used in off-road applications. MSHA will continue to issue approvals for mining engines, but the application process will be abbreviated. Many of the provisions of part 7 are intended to ensure that engines continue to be manufactured in the same configuration and with the same emissions as the engine tested by MSHA. Procedures within the EPA approval programs reach the same end. Additionally, EPA has the resources and the regulatory authority to conduct an extensive quality assurance program to monitor emissions from production engines.

In addition to streamlining the application process, MSHA will establish a program under which the engine emission tests conducted for EPA approval will satisfy the part 7 testing requirements. The test cycles under which emissions are tested for both MSHA and EPA are identical, and the gaseous emission results from the EPA tests can be used to establish the ventilating air quantity that appears on the engine approval plate and is referenced in mine ventilation regulations. MSHA will announce the specifics of the program when it is finalized.

As noted in the prior section, MSHA expects that most operators will turn first to hot gas filters to reach the interim or even the final limit. Technically, an operator using a commercial filtration device would, upon a request from MSHA, have to provide evidence that the device is capable of reducing the emissions of the machine on which it is to be installed to the emission standard. The procedures by which a mine operator will demonstrate compliance with the rule are described in detail in the discussion of 30 CFR 72.503 of this part. However, the particulate removal efficiency of many commercially available hot gas filters is evaluated by VERT. VERT is a joint project of several European regulatory agencies, and private companies involved in the tunneling industry. VERT maintains facilities for the testing and evaluation of diesel engine aftertreatment devices for use on equipment used in tunneling. MSHA will accept dpm filtration efficiencies determined by VERT under the provisions of 30 CFR 72.503(c) of this rule.

VERT evaluates the filtration efficiency of candidate devices using a diesel engine with an average dpm production of 0.08 gr/hp-hr. This engine produces less dpm than the majority of engines approved by MSHA. As further discussed in section 72.503, the test must be conducted on an engine that emits no more dpm than the engine that the aftertreatment device will be used on in the machine. This is to ensure that ''dirty'' engines are not used to over estimate a filter efficiency. The VERT engine used is considered a clean engine by current production standards and clean when compared to many engines in the current underground fleet. The assigned filter efficiencies from VERT would not be considered over-rated and would be consistent with expected efficiencies when used on current underground engines. Consequently, the filter efficiency determined by VERT test can be used to establish the machine dpm level in order to comply with 72.503(b)(i).

MSHA received some comments suggesting the agency could not rely upon the most recent VERT test data (listed in Table II–4) because not enough is known about how those results were derived. MSHA agrees that more information about the test data would be useful; however, given the purposes for which the agency is relying upon the data, the agency believes the information it currently has on the test data are adequate. This information is discussed in section 6 of Part II. The VERT data is generated through procedures as stringent as those MSHA is requiring in the tests which are being established in the final rule for filters not tested by such an organization. While the results noted in Table II–4 have not been incorporated into a published article and has references that are in other sources, MSHA's review of other VERT papers shows that VERT is using the same nomenclature in all their reports and the pertinent information needed from the table is available from these other VERT papers. The table shows VERT results on filters tested ''new'' and after field test. MSHA is only concerned with the ''new'' filter efficiency data for applying a filter efficiency number to the baseline engine emission data in order to determine if the machine meets the machine emission limit specified in this final rule. The range of filter efficiencies is not critical since the operator can choose a filter system based on the need for the engine for each individual machine.

MSHA will maintain a list of dpm filtration devices and their filtration efficiencies on its website at www.msha.gov to assist the mining community. Where the particulate reduction capability of an aftertreatment device is not known, the operator would have to have the system tested at a laboratory capable of performing the tests as described in 30 CFR 72.503 of this rule to obtain the necessary data. However, in a majority of cases the mine operator will not be required to submit any data nor have the aftertreatment device tested. Since ceramic filters are used in general industry and automotive applications worldwide, extensive information on filter efficiency is available and a variety of hot gas filters are commercially available.

The two tier machine emission limits provide operators with a choice when making initial control decisions—whether to select a control that will bring the equipment into compliance with the interim limit first, or whether to go ahead and purchase controls that will be required in any event by the final emissions limit. MSHA envisions that the mine operator will in most cases make a single decision as to the options to select to bring the machine into compliance. If the machine is old

and is expected to reach the end of its useful life in 4 years or less, the mine operator may choose a less costly set of options with the intention to scrap the machine when the lower emission level is effective. However, if the machine has a life expectancy beyond four years, then the mine operator may choose to install a filter system/engine combination that will meet the 2.5 gm/hr standard immediately. Moreover, MSHA has reviewed the VERT list and it identifies several filter systems that can be purchased that have sufficient efficiency ratings to meet the 2.5 gm/hr standard when matched to the majority of the MSHA approved engines in heavy-duty equipment, generators and compressors. MSHA anticipates that more such high efficiency filters will become available before the final emissions limit must be reached. Accordingly, some operators may be able to satisfy the requirements in this fashion.

Yet another alternative that can currently enable heavy-duty equipment to reach the 2.5 gm/hr final limit is the DST® system. Test data was submitted for the record showing an overall system efficiency of greater than 95%. While more costly than hot gas filters, this approach might in some cases be cheaper than a high efficiency hot gas filter and a new engine.

The final rule prohibits any piece of nonpermissible heavy duty diesel powered equipment, generator or compressor, from exceeding 5.0 grams per hour of diesel particulate emissions. MSHA believes that by working with manufacturers of aftertreatment systems, filters can be installed so that newly manufactured machines comply with this requirement. MSHA expects that new equipment, or any equipment with an expected service greater than four years will be provided with a filter capable of meeting the 2.5 gm/hr machine standard.

Section 72.502 Requirements for nonpermissible light-duty diesel powered equipment other than generators and compressors

Organization. The proposed rule did not contain specific provisions for light-duty diesel powered equipment. However, in the preamble to the rule, the agency asked the mining community if light-duty equipment should be subject to provisions that would address dpm emissions. This section is new in the final rule and is based on the large response from the mining community to that question.

Summary of final rule. Paragraph (a) of this section provides that light-duty equipment (other than generators or compressors, which are covered by 30 CFR 72.501) introduced into an underground area of an underground coal mine more than 60 days after the issuance of the final rule cannot emit more than 5.0 grams/hour of dpm. MSHA means by ''introduced'' any equipment added to the mine's diesel equipment inventory. That inventory, and any changes to it, must be recorded by an operator as a result of this rulemaking and be maintained pursuant to new 30 CFR 72.520. This includes newly purchased equipment, used equipment, or a piece of equipment receiving a replacement engine with a different serial number than the engine it is replacing, including engines or equipment coming from one mine into another, but it does not include a piece of equipment whose engine was previously part of the mine's inventory and rebuilt. MSHA will exempt newly manufactured light-duty equipment from meeting the requirements in 30 CFR 72.502, if the equipment is received after the 60 day time frame as long as a mine operator can present evidence that the equipment was ordered prior to the date of publication of this final rule.

Paragraph (b) provides that an engine will be deemed to be in compliance with this requirement if it meets or exceeds certain EPA dpm emission requirements listed in Table 72.502–1 which appears in the rule.

Paragraph (c) excludes any diesel-powered ambulance or fire fighting equipment that is being used in accordance with the mine fire fighting and evacuation plan from the requirements of this section.

Why the final rule covers newly introduced light-duty equipment. The final rule's coverage of newly introduced light-duty equipment stems directly from an alternative which MSHA placed before the mining community in the preamble to the filter-efficiency based rule that was proposed.

In reviewing alternative approaches considered by the Agency, the preamble of the proposed rule (63 FR 17564) noted that light-duty equipment does contribute to the total particulate concentration in underground coal mines, and explored the possibility of requiring light-duty equipment to be treated like permissible and heavy-duty equipment. The agency noted that it had tentatively concluded that requiring controls for the whole light duty fleet may not be feasible for the underground coal sector at this time. In this regard, it should be noted that this type of equipment in underground coal mines makes up approximately ⅔ of the whole fleet: 2096 engines out of the total MSHA inventory of 3121.

The preamble further stated that the Agency welcomed ''information about light-duty equipment which may be making a particularly significant contribution to dpm emissions in particular mines or particular situations, and which is likely to continue to do so after full implementation of the approval requirements of the diesel equipment rule''. As noted in connection with 30 CFR 72.501, the record on this point led MSHA to treat light duty generators and compressors the same way as heavy duty nonpermissible equipment in the final rule.

The preamble to the proposed rule also indicated MSHA's specific interest in exploring whether it would be feasible to require controls on just the new equipment being added to the light duty fleet. ''The Agency would also welcome comment on whether it would be feasible for this sector to implement a requirement that any new light-duty equipment added to a mine's fleet be filtered.'' The Agency further noted that limiting a filtering requirement to just this portion of the light duty fleet was a different issue in terms of economic feasibility than filtering the whole fleet. ''By way of rough cost estimate, if turnover is only 10% a year, for example, the cost of such an approach would be only about a tenth of that for filtering all light-duty outby.'' 63 FR 17564. This discussion was repeated in the section by section review of the proposed rule. (63 FR 17556) The Agency reiterated its request for comments in this regard in its Questions and Answers (Q and A #10, 63 FR 17499).

As noted in the discussion of 30 CFR 72.501 of this part, MSHA received considerable comment on whether the light duty fleet as a whole should be covered. In a significant number of mines, the light duty fleet may work under heavy loads for considerable periods of time, resulting in localized intensive exposures. But it would also appear that in other mines this is not the case; moreover, many of the experiences with localized exposures may have been due to maintenance problems, as the diesel equipment rule with its requirements for maintenance had yet to go into effect.

Also, many miners commented that large numbers of light-duty equipment were in the same area of the mine on occasion and their emissions were not adequately diluted by the ventilation air provided. MSHA believes these comments were made based on experience gained before the effective date of the ventilation requirements under the diesel equipment rule.

Section 70.1900(a)(4) of the diesel equipment rule now allows the district manager to establish areas in the mine where air quality samples for gases must be collected to identify and correct problems such as those described. Even though the focus in 30 CFR 70.1900(a)(4) is on gaseous emissions, the point is that a buildup of gaseous emissions would be an indication of a build up of diesel emissions generally and thus, of the inadequate ventilation that was the concern of the commenters.

The comments about the light duty fleet as a whole were not particularly helpful in evaluating the agency's specific request for comment on whether it would be feasible for this sector to implement a requirement that the emissions from any new light-duty equipment added to a mine's fleet be limited. Nevertheless, as noted in Part III, the best available evidence is that a significant risk of adverse health effects due to dpm exposures will remain even after this rule will be implemented. Since the Agency is under a legal obligation to eliminate significant risks to the extent feasible, the Agency determined it should conduct a further analysis of the feasibility of limiting emissions from newly introduced light-duty equipment into underground coal mines. The service life of light-duty equipment (*e.g.,* pickup trucks) is roughly ten years—much shorter than other types of equipment which is often rebuilt underground. Accordingly, if the engines in the new equipment are cleaner than the ones in the old equipment, the dpm emissions in the mine can be lowered over this period of time without the need to place controls on the existing fleet.

MSHA then examined the kinds of engines that were likely to be in new light-duty equipment, as compared with the engines in the current light duty fleet. It turns out that there is likely to be a major difference. Many of the engines in the current fleet were designed and produced before the advent of EPA emission standards. Almost all of those engines likely to be available for introduction underground in the future will be subject to such standards. Accordingly, MSHA has determined that if newly introduced light duty engines or equipment are limited to more recent models, the dpm emissions from the new light duty fleet will eventually be significantly less than from the current fleet. The service life of light-duty equipment (*e.g.,* pickup trucks) is roughly ten years—much shorter than other types of equipment which is often rebuilt underground. As explained in the next section of this discussion, MSHA determined that requiring all light-duty equipment introduced underground in the future to comply with these standards is feasible; the engines required to meet the requirement are available in all types and sizes. Accordingly, the agency decided that the record warranted adoption of the alternative it had placed before the mining community, and the final rule establishes emission standards for newly introduced light-duty equipment.

How did MSHA determine the emissions limit for newly introduced light-duty equipment? MSHA examined whether it could establish the standard for newly introduced light-duty equipment at the same level as the standard it is establishing for newly introduced heavy-duty equipment, generators and compressors. In this regard, the agency looked at two sets of existing requirements to determine what types of engines used in light-duty equipment are readily available today, and then set the standard accordingly. First, the agency looked at current MSHA approval standards, and then it looked at current EPA standards.

The record indicated that equipment in the light duty fleet may be used to the extent that the dpm emissions from these vehicles could contribute to overall mine air quality in a manner similar to heavy-duty equipment. However, an equal number of commenters stated that light-duty vehicles are not used very much except for transporting miners in, out, and around the mine on a limited basis. MSHA believes that mines utilizes their light duty fleet in various ways depending on the individual mine conditions, fleet management, and standard operating practices. Also MSHA believes that many light-duty vehicles are operated in areas of the mine where the ventilation rate exceeds the approval plate quantities. Because MSHA did not receive sufficient information to establish the need to control dpm emissions from light-duty equipment to the same degree as required for heavy duty or permissible equipment, MSHA established a new approach. MSHA determined that no action needs to be taken to modify equipment in the existing light duty fleet. However, MHSA wanted to ensure that steps be taken to limit the dpm emissions from any light-duty equipment introduced into mines. The steps would include purchasing equipment that uses engines representative of the state-of-the-art in emission control that are commercially available. These engines would be the type that are being manufactured to comply with the current EPA standards for diesel engines for both on-highway and nonroad applications. MSHA also recognized that manufacturers of mine specific vehicles currently utilize engines of older design that would not meet the EPA standards. Manufacturers of this equipment could continue to use these engines with appropriate after treatment of the exhaust to limit the dpm emissions.

In its deliberations to determine the emissions standard that was required to be met by heavy-duty equipment, MSHA also determined that engines in existing light-duty equipment could be provided with commercially available aftertreatment controls to reduce the dpm emissions to 5.0 gm/hr. In fact, some light-duty equipment with relatively low horsepower engines can meet a 5.0 gm/hr standard without any aftertreatment controls.

Some existing light-duty equipment built specifically for mine use is representative of equipment that will probably continue to be introduced into the mines. This type of light-duty equipment will continue to use engines that would not meet the EPA dpm standards. Hence for any such equipment introduced into an underground coal mine after the effective date, aftertreatment will be required.

Consequently, MSHA established the 5.0 gm/hr standard for any light-duty equipment introduced into mines after the effective date of the rule.

As stated above, part of the approach established by MSHA for light-duty equipment was to ensure that introduced light-duty equipment would be provided with engines representative of the state of the art in emission control that are commercially available. These engines would be the type that are being manufactured to comply with the current EPA standards for diesel engines for both on-highway and nonroad applications.

As noted in section 5 of Part II, the EPA emission standards are established for light-duty vehicles and trucks, heavy duty highway engines, and nonroad engines. These requirements take effect for new production runs of engines at various times depending on engine type and size. MSHA recognizes that introduced equipment provided with these engines may exceed the 5.0 gm/hr standard. However, the engines being built to meet the EPA standards represent the state of the art in emission controls that are feasible to limit diesel exhaust emissions for those sizes of engines. MSHA did not intend to require aftertreatment controls on introduced light-duty equipment. MSHA believes that as long as mine

operators purchase equipment with these new engines, the in-mine dpm concentrations will be reduced as the existing light-duty equipment fleet is replaced.

MSHA has established an exception in 30 CFR 72.502(b) that would allow mine operators to introduce equipment powered by engines that meet the EPA standards listed in Table 72.502–1 in lieu of meeting the 5.0 gm/hr standard given in 72.502(a). MSHA also knows that the EPA intends to tighten the emission standards for new diesel engines. As engines meeting these future requirements are produced, they will also become available for use in mining equipment, thus the overall contribution of dpm from the in-mine light-duty equipment should decrease even further.

MSHA has already approved engines produced by a variety of engine manufacturers in a wide range of horsepowers that meet the EPA standards listed in Table 72.502–1 of this part. These engines are shown on Table IV–1 by an asterisk (*).

Many pickup trucks used in underground coal mines use engines that would be classified by the EPA as ''heavy duty highway engines''. Consequently, if the engine was produced after 1994, it has met the EPA emissions standard of 0.1 g/bhp-hr shown in table 72.502–1. MSHA believes that the mining community is not likely to have any problem finding a pickup truck that meets the standard. Many pickup trucks can be moved from mine to mine and meet the standard.

This is basically the same for any on-highway engine the EPA classifies as a ''light-duty vehicle'' or ''light duty trucks''. If manufactured in or after model year 1994, the vehicle or truck must be limited to a dpm output of 0.1 gr/mile and meets the EPA requirement. However, there are no such vehicles currently in use in mines.

Mine operators frequently purchase equipment for use in underground coal mines that come with engines which are categorized by EPA as nonroad engines for use in underground coal mines. This includes both industrial equipment and mine specific equipment such as forklifts, rockdusters, tractors, pumps, manlifts, personnel carriers, and welders. EPA's requirements on nonroad engines vary by horsepower. As discussed in part II of this preamble, EPA originally regulated these engines at standards referred to as tier 1. The most recent standards that are scheduled to become effective for these engines are designated as tier 2 standards. Many of the engines used in this equipment will soon be meeting the EPA tier 2 dpm limits as a result of the 1998 rulemaking by that agency. MSHA chose the tier 2 standards in 30 CFR 72.502(b) of this part since they will represent the most advanced technologies for emission controls. As previously stated, some nonroad engines are already being produced which meet the tier 2 requirements and have been approved by MSHA. Approximately two-thirds of the nonpermissible MSHA approved engines meet the tier 2 standards. The exact EPA emission limits for each tier for each engine size category are listed in Table 72.502–1 of the final rule which is reproduced here in the preamble for reference:

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TABLE 72.502-1: EPA's Requirements on Nonroad Engines

EPA Requirement	EPA Category		PM Limit
40 CFR 86.094-8(a)(1)(I)(A)(*2*)	light-duty vehicle		0.1 g/mile
40 CFR 86.094-9(a)(1)(I)(A)(*2*)	light duty truck		0.1 g/mile
40 CFR 86.094-11(a)(1)(iv)(B)	heavy duty highway engine		0.1 g/bhp-hr
40 CFR 89.112(a)	Tier 2 nonroad		varies by power:
	kW<8	(hp<11)	0.80 g/kW-hr (0.60 g/bhp-hr)
	8≤kW<19	(11≤hp<25)	0.80 g/kW-hr (0.60 g/bhp-hr)
	19≤kW<37	(25≤hp<50)	0.60 g/kW-hr (0.45 g/bhp-hr)
	37≤kW<75	(50≤hp<100)	0.40 g/kW-hr (0.30 g/bhp-hr)
	75≤kW<130	(100≤hp<175)	0.30 g/kW-hr (0.22 g/bhp-hr)
	130≤kW<225	(175≤hp<300)	0.20 g/kW-hr (0.15 g/bhp-hr)
	225≤kW<450	(300≤hp<600)	0.20 g/kW-hr (0.15 g/bhp-hr)

Notes: "g" means grams "kW" means kilowatt
"hp" means horsepower "g/kW-hr" means grams/kilowatt-hour
"g/bhp-hr" means grams/brake horsepower-hour

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In this final rule, operators have the option to meet the requirements of the standard by installing filters on newly introduced light-duty equipment. For example, an operator wishing to take an existing piece of light-duty equipment whose emissions exceed 5.0 grams/hour from one mine and use it in another mine could do so if the machine is equipped with a filter or catalytic converter efficient enough to bring the emissions down to 5.0 grams/hour. MSHA anticipates that the majority of mine operators will choose to purchase equipment with MSHA approved engines meeting the EPA dpm standards. Some models of small utility equipment might be difficult to filter, so the mine operator will probably choose to introduce this type of equipment with an engine that meets EPA requirements. However in some cases where an engine which complies with the 5.0 g/hr standard or the EPA requirements is too expensive or hard to use for a specific machine application, a filter system can be designed in during the construction of the vehicle instead of a retrofit.

The Agency wishes to emphasize that it is not barring operators from introducing used equipment into an underground coal mine simply because it is used. As noted in the examples above, many of these EPA requirements have been in place for a while, so operators should have a wide choice of equipment from which to choose, and in other cases there are MSHA approved engines that will meet the standards.

MSHA will undertake other actions to further facilitate compliance with this standard. As noted above, MSHA is enabling operators to comply with this standard by selecting engines or equipment that comply with various EPA standards. However, under the diesel equipment rule, all engines used underground have to be approved by MSHA. Accordingly, MSHA is reviewing actions that could be taken to facilitate the approval process when an engine meets EPA standards.

As was described earlier in the discussion of the heavy-duty equipment requirements, MSHA is developing a program which will streamline the procedures by which manufacturers of diesel engines intended for use in outby areas of underground coal mines can gain Agency approval. The program will draw on the EPA testing procedures (currently used only in the certification program for nonroad engines). MSHA will announce the specifics of the program when it is finalized. This program, when implemented, will assure mine operators and mining equipment manufacturers of the availability of low emissions engines, approved by both MSHA and EPA, in a wide range of horsepowers with which they can easily comply with the dpm requirements for light-duty equipment.

Exemption for ambulances and fire fighting equipment. Paragraph (c) of this section excludes from these requirements diesel powered ambulance and fire fighting equipment being used in accordance with the mine fire fighting and evacuation plan under 30 CFR 75.1101–23. This is done in the same manner as MSHA excluded this type of equipment in the diesel equipment rule. This exclusion ensures consistency between this rule and the diesel equipment rule.

Section 72.503 Determination of Emissions; Filter Maintenance

Organization. This section is added to the final rule to specify the means to determine and maintain compliance with the machine emission limits established in this part. The requirements of this section revise and refine provisions included in the proposal under 72.500(c) and (d). The requirements have been moved to a separate section because they are relevant to the requirements of several other sections—30 CFR 72.500, 72.501 and 72.502.

Engine emissions. Section 72.503(a) of the final rule specifies that the amount of dpm emitted by a particular engine shall be determined from the engine approval pursuant to 30 CFR 7.89(a)(9)(iii)(B) or 7.89(a)(9)(iv)(A), except for those engines in light-duty equipment deemed to be in compliance with the requirements of this rule pursuant to 30 CFR 72.502(b).

This approach using part 7 engine approval data was inherent in the requirements of proposed 30 CFR 70.500(d). The current formulation refines the requirement to make it more clear and extends coverage to the EPA approval program.

MSHA currently lists all part 7 engine approvals on the Internet. The web addresses have been previously listed in this section. To assist mine operators in complying with the provisions of this rule, MSHA will add the dpm grams per hour number for each approved engine based on the approval test data. This number is calculated from the equations in 30 CFR 7.89(a)(9)(iii)(B) or 7.89(a)(9)(iv)(A) which are direct results of tests conducted for determination of the particulate index. This value will be used as an engine's baseline dpm concentration; the efficiency of the filter will then be multiplied by this baseline dpm number to establish compliance with the machine's emission limit under the appropriate section of this rule. MSHA will use the gm/hr data obtained from the MSHA approval data and not the gm/hr data determined from other filter tests that determine the efficiency of the filter being tested. Results from different engine configurations or different laboratories could give results that could prevent the mine operator from showing compliance. The data could also be different if the tests were run differently from the approval test.

Laboratory test procedures for testing aftertreatment devices; MSHA acceptance of results of other organizations. Section 72.503(b) of this final rule provides that the efficiency of an aftertreatment device is to be established by a laboratory test with a device representative of that to be used—and not by an actual test at the mine site on a particular filter. The test of the aftertreatment device is to be on an approved engine that emits no more dpm than the engine in the machine on which the aftertreatment device is to be used. If the filter test were run on an engine with higher emissions, the filter is likely to be rated as having a higher efficiency than it does when installed on an engine that produces lower emissions. This is consistent with the views of those commenters who objected to the proposal to establish a 95% efficient filter standard on the grounds that they would not be able to maintain such an efficiency as cleaner engines are introduced. The engine is to be run on the same test cycle used for MSHA approvals. The test procedure to follow must be appropriate to the filter media being tested. Furthermore the test is to be done by a laboratory capable of testing engines in accordance with MSHA approval requirements, to ensure consistency among testing and results.

Although these requirements provide the specifications for filter efficiency tests, MSHA does not believe that many filter tests will need to be run in order for mine operators to comply with the requirements of this rule. A key reason is that 30 CFR 72.503(c) allows the Secretary to accept the results of tests conducted or certified by an organization whose testing standards are deemed by the Secretary to be as rigorous as those set forth in 30 CFR 72.503(b). Also, the Secretary may accept the results of tests for one aftertreatment device as evidencing the efficiency of another aftertreatment device which the Secretary determined to be essentially identical to the one tested.

With respect to hot gas filters, the agency has already indicated (in the discussion of 30 CFR part 72.501) its intention to accept the efficiency results of any filter tested by VERT—

notwithstanding their use of somewhat different test procedures. MSHA will provide additional information on how mine operators can easily obtain the filter efficiency data from VERT in the compliance guide for this rule.

Moreover, the record of this rulemaking contains data establishing the efficiency of both the DST® system and paper filters. Both of these were tested by SwRI in tests meeting the requirements of this section. MSHA has indicated (in the discussion of proposed section 72.500 of this part) that it will accept as having the same efficiency as the paper filter it tested, any filter using the same or equivalent media. Such filter paper appears to be used for the production of a variety of filters. Consequently, effective filters will be readily available.

The filter efficiency test procedure stated in this final rule is basically the same as that procedure specified in the proposal. This test procedure follows the test cycle specified in part 7, subpart E, for determination of the particulate index. This test is similar to the test procedure used by VERT. VERT has streamlined their test procedure to minimize testing time but retained the main dpm producing modes on the steady state test cycle. The MSHA test procedures in part 7, subpart E were originally adapted from the ISO 8178 procedures. VERT actually follows the test procedures in ISO 8178.

Several commenters questioned whether the ISO 8178 is an appropriate test for performing the filter efficiency tests, but offered no suggestions as to a cycle which should be used. Other commenters stated that the ISO 8178 is the best test at this point in time for conducting the filter efficiency test since no other cycle is available. Because ISO 8178 is an internationally accepted test cycle for evaluating diesel engine emissions, MSHA is retaining the ISO 8178 test procedure in this final rule. However the rule does allow the Secretary to accept data from tests.

MSHA will maintain a list (posted on its web site) of additional sources from which mine operators and inspectors can obtain the necessary information, including aftertreatment manufacturers who follow testing procedures MSHA deems meet its requirements. Mine operators will have to show evidence that for each particular machine, the engine baseline data multiplied by the filter efficiency will meet the appropriate standard. Any questions on acceptance of a filter manufacturer should be made prior to purchasing of the filter media. The mine operator may want to contact MSHA's approval and certification center located at Triadelphia, WVA to determine that the filter efficiency data is acceptable prior to purchasing, especially if the filter data is not from VERT or from a source listed by MSHA.

One commenter stated that industry was concerned that laboratory tests of filters may give invalid indication of filter efficiency. MSHA believes that the filter test should be appropriate to the media; that is the aftertreatment device should be tested with the contaminant that is being controlled. The aftertreatment industry has been testing filters in the laboratory for many years in development of their products. In the case of ceramic type filters, MSHA is not aware of any types of tests performed on ceramics that does not use dpm from the diesel exhaust. Aftertreatment control manufacturers that build dpm control devices test their systems for various applications worldwide, through both laboratory and field work.

Other types of filter media (*e.g.,* paper) have been developed by the mining industry for use on permissible equipment which is specific to mining. General industry does not use paper for dpm reduction due to the high exhaust gas temperatures from diesels. Paper filters are mainly produced as intake air cleaners and industry test standards for determining air cleaner efficiency are followed. Since these filters are mainly used for intake air filters, MSHA believes that industry standard intake air filter tests could be representative tests for this type of filter media when used for dpm reduction. MSHA would compare the paper specifications to determine equivalency. If the papers were equivalent, then air filter type tests would be acceptable to the Secretary for this type of media.

Aftertreatment device maintenance requirements. Section 72.503(d) of this rule states that any aftertreatment device installed on a piece of diesel equipment, upon which the operator relies to remove dpm, shall be maintained in accordance with manufacturer specifications and shall be free of observable defects. Except for the last phrase, which was added by MSHA in order to clarify the requirement for the mining community, this requirement was specified in the proposal under section 72.500(d).

One commenter requested that MSHA also require an on board engine performance and diagnostic system. MSHA is aware that some permissible machines have added electronic type shut down systems and electronic controlled fire suppression systems. On some newer nonpermissible engines, especially larger engines, engine manufacturers use electronic controls to regulate the engine's fuel injection timing and governing. Engines equipped with these electronic devices typically have complete diagnostic capability. MSHA believes as engine technologies develop, more engines will have diagnostic systems built in from the manufacturer. MSHA is not requiring in this final rule on board engine performance and diagnostic systems on equipment. However, MSHA will work with engine manufacturers under the part 7 approval process to evaluate new electronic controls, especially for permissible engines.

Other commenters stated that maintenance is part of the toolbox approach, and therefore ought not to be specifically included. MSHA has a requirement in the current diesel equipment rule to maintain diesel powered equipment in approved and safe condition or be removed from service. This final rule is extending the requirements for maintenance specifically to aftertreatment controls added to the machines to reduce dpm.

Section 72.510 Miners Health Training

Paragraph (a) of this section requires annual hazard awareness training of underground coal miners who can reasonably be expected to be exposed to dpm. Paragraph (b) includes provisions on records retention, access and transfer.

Section 72.510(a) of this rule would require any underground coal miner ''who can reasonably be expected to be exposed to diesel emissions'' be trained annually in: (1) The health risk associated with exposure to diesel particulate matter; (2) the methods used in the mine to control diesel particulate matter concentrations; (3) identification of the person responsible for maintaining those controls; and (4) actions miners must take to ensure the controls operate as intended. The final rule is the same as that proposed.

The purpose of these requirements is to promote miner awareness. Exposure to diesel particulate is associated with a number of harmful effects as discussed in Part III of this preamble, and the safe level is unknown. Miners who work in mines where they are exposed to this risk must be reminded of the dpm hazard to make them active and committed partners in implementing actions that will reduce that risk.

Several commenters expressed concern about which miners will be required to be trained. MSHA believes the rule is clear on this issue. The training need only be provided to underground miners who can reasonably be expected to be exposed to

dpm at the mine. The training is to be provided by the operator; hence, it is to be without cost to the miner.

The rule places no constraints on how the operator should conduct this training. MSHA believes that the required training can be provided with minimal cost and with minimal disruption. This final rule does not require any special qualifications for instructors, nor does it specify the hours of instruction.

One-on-one discussions that cover the required topics is one approach that can be used. Alternatively, instruction could take place at safety meetings before the shift begins. Several of the training requirements can be covered by simply providing miners with a copy of MSHA's ''toolbox.'' Operators may determine how the ''toolbox'' can be used at their mine.

The Agency requested comments concerning inclusion of dpm training in the required part 48 training plan. The only comment received suggested that this training be included in the part 48 training and removed from this rule. MSHA considered whether the requirements of part 48 were adequate to ensure the training required under the final diesel particulate standard. After careful consideration, MSHA concluded that available information provided to miners under current part 48 training would be inadequate to fully convey information under the diesel particulate final rule. MSHA will, however, accept part 48 training for compliance with diesel particulate training requirements under this section, provided mine operators fully integrate the requirements of diesel particulate training into their existing program.

Section 115 of the Federal Mine Safety and Health Act of 1977 and 30 CFR part 48, ''Training and Retraining of Miners,'' requires operators to submit to MSHA and obtain its approval of training plans under which miners are provided training, primarily through initial and annual refresher training courses. Part 48, among other things, also specifies qualifications for training instructors, minimum training hours for miners and instruction on particular topics which must be covered within the specified minimum training time. Existing section 48.8(a) establishes a minimum of eight hours of annual refresher training for underground miners. Section 48.8(b), specifies that underground miners must be trained on a minimum of eleven different subjects, none of which MSHA believes would cover the specific requirements for diesel particulate training.

Nevertheless, MSHA believes compliance with this proposal can in many cases be fulfilled at the same time as scheduled part 48 training. The Agency, however, does not believe special language is required in this final rule to permit this action under part 48. If incorporated into part 48, mine operators would, however, be required to submit a revised training plan to the appropriate MSHA district office for approval. Some mine operators, however, may not be able to incorporate these topics in their part 48 plans. MSHA has endeavored to make the training requirements as simple as possible. If conducted separately from part 48 training, there are no specifications on trainer qualifications, no minimal training time, nor any training plans. If, however, the training is incorporated into part 48, then all applicable part 48 requirements will have to be met.

A commenter expressed concerns about individual MSHA inspectors determining their own set of health risks for training purposes and then trying to cite a company for not training on those health risks. They also suggested that the Agency develop a ''Question and Answer'' document to address this problem. To address the mine operators concern about the training requirements, MSHA intends to develop an instruction outline that mine operators can use as a guide for training personnel. Instruction materials will also be provided with the outline. MSHA believes this will not only provide guidance to the mining industry but also to MSHA inspectors.

The final rule does not require the mine operator to separately certify the completion of the dpm training, but some evidence that the training took place would have to be produced upon request. A serial log with the employee's signature is an acceptable practice.

Section 72.510(a)(1) of this rule requires the operator to train underground miners who can reasonably be expected to be exposed to diesel emissions in the health risk associated with dpm exposure. Several commenters disagreed with this requirement. They do not believe the health risks associated with exposures to diesel emissions have been sufficiently identified. ''If the health effects have not been identified, how can effective training be provided to the effected miners?'' MSHA disagrees with this comment. MSHA believes, as throughly discussed in Part III of this preamble, that the health effects associated with diesel emissions have been well documented. Comments received during this rulemaking further support MSHA's position concerning health effects associated with diesel emissions. Therefore, the requirements for training underground miners who can be reasonably be expected to be exposed to diesel emissions have been retained in the final rule.

Section 72.510(a)(3) of this rule requires the operator to identify personnel responsible for maintaining the methods used to control dpm in the mine. Some commenters suggested removing this provision from the rule. These commenters objected to identifying the personnel responsible for maintaining the methods used to control dpm. Because they were concerned about having the employee, ''singled out from the remaining workforce.'' Another commenter, asked how MSHA wanted the operator to identify the employee responsible for maintaining dpm controls; is the name to be posted, made available to interested persons, put in the training plan, etc? While there is no provision in this final rule for posting the information on the mine bulletin board or in any other location, this information is required to be presented to any underground miner who can reasonably be expected to be exposed to diesel emissions. The final rule requires this information to be presented at least annually but does not specify any specific method for presenting the information. The operator has the option of presenting this information orally or in written form.

The Agency believes this provision is consistent with the requirements contained in 30 CFR 75.1915(c). 30 CFR 75.1915(c) requires the operator to maintain a record of persons qualified to perform maintenance, repairs, examinations and tests on diesel-powered equipment. The operator is also required by § 75.1915(c) to include a copy of the training program used to qualify persons to perform maintenance, repairs, examinations and tests in their records. Section 75.1915(c) also requires the operator to make this record available for inspection by an authorized representative of the Secretary of Labor. All records that would need to be maintained concerning the qualification of personnel responsible for maintaining dpm controls are contained in § 75.1915(c). The individuals identified by § 75.1915(c) would also be the individuals identified in § 72.510(a)(3). The requirement to identify personnel qualified to perform specialized tasks is not a novel approach. Therefore, § 72.510(a)(3) has not been changed or deleted from the final rule.

Section 72.510(b)(1) of this rule requires that any log or record produced signifying that the training has taken place would be retained for one year. A commenter stated other records are not required to be maintained and should not be required by this rule. Numerous training records are required to be maintained for a variety of training requirements throughout 30 CFR, and MSHA believes that retention of the record for one year is important for documentation purposes. Therefore, § 72.510(b)(1) of this rule was not changed from the proposed rule and is incorporated in this final rule.

The training records need to be where an inspector can view them during the course of an inspection, as the information in the record may determine how the inspection proceeds. If the mine site has a fax machine or computer terminal, MSHA would permit the record to be maintained elsewhere so long as they are readily accessible. This approach is consistent with the Office of Management and Budget Circular A–130 and 30 CFR 75.1915(c).

Paragraph (b)(2) of section 72.510 of this rule requires mine operators to provide prompt access to the training records upon request from an authorized representative of the Secretary of Labor, the Secretary of Health and Human Services, or from an authorized representative of the miners. If an operator ceases to do business, all training records of employees are expected to be transferred to any successor operator. The successor operator is expected to maintain those training records for the required one year period unless the successor operator has undertaken to retrain the employees. There were no comments received concerning the maintenance of records by a successor operator. Therefore, the final rule has adopted the wording as published in the proposed rule.

Section 72.520 Diesel Equipment Inventory

Proposed § 75.371(qq) would have required, ''A list of diesel-powered units used by the mine operator together with information about any unit's emission control or filtration system.'' One commenter stated that the proposal was vague and overly burdensome. The commenter also stated that exhaustive, detailed technical specifications were not needed in the approved ventilation plan. MSHA agrees with the comments and has changed the final rule to reflect what MSHA believes is necessary information to help evaluate the effectiveness of dpm controls in underground coal mines. By specifying the information required, MSHA has provided uniform guidance to the mining community as to the information required to be submitted in the diesel equipment inventory.

Another commenter suggested the information be provided and posted at the mine and made available to a representative of the Secretary and other interested person. Another commenter was concerned with the time delay in submitting an addendum to the ventilation plan and the approval of the plan. The commenter stated that this was not required of other equipment used underground and should not be required of diesel-powered equipment. Concerns were raised by several commenters about delays in the approval of revisions to the ventilation plan.

MSHA has taken these comments into consideration and in the final rule has removed the diesel equipment inventory provision from the Approved Ventilation Plan and established it as a separate requirement § 72.520. There was no intent to require that the inventory be approved, but rather to require the information to be provided to MSHA and the representatives of the miners. The final rule requires each mine operator to prepare and submit a diesel equipment inventory to the District Manager. It also clarifies the information that must be included in the inventory. This information must be accurate so that the appropriate emission controls can be matched with an engine and to ensure that the required emission rates during the phase-in period are met. If there are modifications to the inventory, such as equipment being added or deleted, or changes to emission control systems, these modification must be submitted to the District Manager within 6 months. If no changes to the inventory are made, there is no need to update the diesel equipment inventory. The final rule also requires that mine operators provide a copy the diesel equipment inventory to the representative of the miners within 3 days.

Effective Dates

The final rule provides that unless otherwise specified, its provisions take effect 60 days after the date of promulgation. Some provisions of the final rule contain delayed effective dates that provide more time for technical assistance to the operators. Table I–1 presents the effective dates of various provisions of the final rule is reproduced below for convenience.

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Table I-1

Type of Equipment	Emissions Limit	When Applicable (from date final rule published)
Permissible		
newly introduced	2.5 grams per hour	60 days
existing fleet	2.5 grams per hour	18 months
Heavy duty nonpermissible		
newly introduced	5.0 grams per hour	60 days
existing fleet (interim)	5.0 grams per hour	30 months
existing fleet (final)	2.5 grams per hour	4 years
Generators and compressors	same as heavy duty	same as heavy duty
Other light duty nonpermissible		
newly introduced	5.0 grams per hour (or listed EPA standards)	60 days
existing fleet	no requirements	

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The final rule stipulates that any piece of diesel-powered equipment introduced into an underground coal mine 60 days after the promulgation date of this final rule is required to meet specific emission limits. For equipment that is currently used in underground coal mines, the compliance dates vary with regards to the type of diesel-powered equipment used in underground coal mines. MSHA includes in the category of equipment currently in use in underground coal mines any equipment that is ordered on or before the promulgation date of this final rule, even if the delivery date is more that 60 days from the promulgation date. By treating equipment on order as equipment already in use, the Agency is allowing the operator to use the equipment as delivered by the equipment supplier. A valid purchase order would be required of the operator as evidence that the diesel-powered equipment was ordered on or before the promulgation date of the final rule.

The time frame of 60 days after the promulgation date of the final rule also applies to newly introduced diesel-powered equipment as a result of explicit effective dates in 30 CFR 72.500, 72.501, and 72.502 of this rule. Diesel-powered equipment that is introduced in an underground coal mine 60 days after the promulgation date of the final rule must emit no more than 2.5 grams per hour of dpm. The term ''introduced'' is defined in § 72.503(e) and is explained in the appropriate Section-by-Section discussion in this preamble.

Section 72.500(b) of this rule allows the operator 18 months from the promulgation date of the final rule to meet emission limits for permissible diesel-powered equipment currently in use in underground coal mines. Several commenters stated the 18 month time frame was insufficient to comply with the proposed rule. They suggested increasing the effective date to between 2 and 4 years from the promulgation date of the final rule. The proposed rule would have required, in part, a system capable of removing, on average, at least 95% of diesel particulate matter by mass. The only system reportedly available that achieved the filtration efficiency necessary, was the DST® system. As discussed elsewhere in this preamble, the final rule sets emission limits on diesel-powered equipment and allows the operator to use whatever diesel particulate reducing technologies available to meet the limits. Information submitted during the rule making process and verification testing conducted for MSHA, has identified that readily available paper filters can achieve the emission limits set for permissible diesel-powered equipment. Therefore, MSHA has retained the 18 month effective date for diesel-powered equipment currently in use in underground coal mines.

Section 72.501 of this rule addresses emission limits for nonpermissible heavy-duty diesel-powered equipment, generators and compressors. There are 3 time tables associated with these pieces of diesel-powered equipment. As with permissible diesel-powered equipment, all nonpermissible heavy-duty diesel powered equipment, generators and compressors introduced into an underground coal mine 60 days from the promulgation date of the final rule would be required to meet a specific dpm emission limit. As stated the final rule differs from the proposed rule, however, the compliance date for newly introduced diesel-powered equipment has not been changed.

The final rule allows 30 months from the promulgation date for the operator to reduce the emission levels to the levels required for newly introduced diesel-powered equipment. Some commenters believe this time frame should be increased to 3 to 4 years.

Another commenter stated the time frame for complying with the standard should be shortened. Based upon information obtained during the rule making process, MSHA believes the 30 month time table is adequate and reasonable to install the necessary particulate controls to comply with the required emission limits.

Section 72.501(c) of this final rule requires all nonpermissible heavy-duty diesel-powered equipment, generators and compressors to meet a stricter emission limit within 4 years after promulgation of the final rule. The proposed rule would have allowed 6 years to achieve these stricter limits. After reviewing the record, particularly information submitted by aftertreatment device manufacturers, MSHA has concluded that these stricter standards can be met in a shorter time frame. Discussions on these emission limits are covered in greater detail elsewhere in this preamble. Therefore, the effective date for the stricter emission limits was reduced from 6 years to 4 years.

Section 72.503 of this final rule addresses nonpermissible light-duty diesel-powered equipment other than generators and compressors. The proposed rule did not address nonpermissible light-duty diesel-powered equipment. As discussed earlier in the preamble, nonpermissible light-duty diesel-powered equipment has been included in this final rule. The final rule only addresses nonpermissible light-duty diesel-powered equipment that is introduced 60 days after the promulgation date of this final rule. Equipment currently in use in underground coal mines is excluded from meeting emission limits. Based upon information gathered during the rule making process, MSHA believes 60 days after the promulgation date of the final rule is reasonable and this requirement has been added to the final rule.

V. Adequacy of Protection and Feasibility of Final Rule; Alternatives Considered

The Mine Act requires that in promulgating a standard, the Secretary, based on the best available evidence, shall attain the highest degree of health and safety protection for the miner with feasibility a consideration.

Overview. This part begins with a summary of the pertinent legal requirements, followed by a general profile of the economic health and prospects of the coal mining industry.

The discussion then turns to the main component of the rule being promulgated by the Agency for underground coal mines. MSHA is requiring that mine operators limit the emissions of dpm to defined quantities for various categories of diesel equipment underground. This part evaluates the rule to ascertain if, as required by the statute, it achieves the highest degree of protection for underground coal miners that is both technologically and economically feasible for mine operators.

About half a dozen regulatory alternatives to the final rule were also reviewed by MSHA in light of the record. After considerable study, the Agency has concluded that compliance with these alternatives either provide less protection than the feasible approach being adopted, or are not technologically or economically feasible for the underground coal mining industry as a whole at this time.

Pertinent Legal Requirements. Section 101(a)(6)(A) of the Federal Mine Safety and Health Act of 1977 (Mine Act) states that the Secretary of Labor (Secretary) in promulgating mandatory standards dealing with toxic materials or harmful physical agents under the Act, shall set standards when most:

> * * * [A]dequately assure, on the basis of the best available evidence, that no miner will suffer material impairment of health or functional capacity even if such miner has regular exposure to the hazards dealt with by such standard for the period of his working life.

The Mine Act also specifies that the Secretary, in promulgating these mandatory standards, must base such standards upon:

> * * * [R]esearch, demonstrations, experiments, and such other information as may be appropriate. In addition, to the attainment of the highest degree of health and safety protection for the miner, other considerations shall be the latest available scientific data in the field, the feasibility of the standards, and experience gained under this and other health and safety laws. Whenever practicable, the mandatory health or safety standard promulgated shall be expressed in terms of objective criteria and of the performance desired. [Section 101(a)(6)(A)].

Thus, the Mine Act requires that the Secretary, in promulgating a standard, based on the best available evidence, attain the highest degree of health and safety protection for the miner with feasibility a consideration.

In relation to feasibility, the legislative history of the Mine Act states that:

> * * * This section further provides that ''other considerations'' in the setting of health standards are ''the latest available scientific data in the field, the feasibility of the standards, and experience gained under this and other health and safety laws.'' While feasibility of the standard may be taken into consideration with respect to engineering controls, this factor should have a substantially less significant role. Thus, the Secretary may appropriately consider the state of the engineering art in industry at the time the standard is promulgated. However, as the circuit courts of appeal have recognized, occupational safety and health statutes should be viewed as ''technology-forcing'' legislation, and a proposed health standard should not be rejected as infeasible when the necessary technology looms in today's horizon. *AFL–CIO* v. *Brennan,* 530 F.2d 109 (1975); *Society of the Plastics Industry* v. *OSHA,* 509 F.2d 1301, *cert. denied,* 427 U.S. 992 (1975).

Similarly, information on the economic impact of a health standard which is provided to the Secretary of Labor at a hearing or during the public comment period, may be given weight by the Secretary. In adopting the language of [this section], the Committee wishes to emphasize that the agency rejects the view that cost benefit ratios alone may be the basis for depriving miners of the health protection which the law was intended to insure. S. Rep. No. 95–181, 95th Cong., 1st Sess. 21 (1977).

Court decisions have clarified the meaning of feasibility. The Supreme Court, in *American Textile Manufacturers' Institute* v. *Donovan* (OSHA Cotton Dust), 452 U.S. 490, 101 S.Ct. 2478 (1981), defined the word ''feasible'' as ''capable of being done, executed, or effected.'' The Court stated that a standard would not be considered economically feasible if an entire industry's competitive structure was threatened. According to the Court, the appropriate inquiry into a standard's economic feasibility is whether the standard is capable of being achieved.

Courts do not expect hard and precise predictions from agencies regarding feasibility. Congress intended for the ''arbitrary and capricious standard'' to be applied in judicial review of MSHA rulemaking (S.Rep. No. 95–181, at 21.) Under this standard, MSHA need only base its predictions on reasonable inferences drawn from the existing facts. MSHA is required to produce a reasonable assessment of the likely range of costs that a new standard will have on the industry. The agency must also show that a reasonable probability exists that the typical firm in the industry will be able to develop and install controls that will meet the standard. See, *Citizens to Preserve Overton Park* v. *Volpe,* 401 U.S. 402, 91 S.Ct. 814 (1971); *Baltimore Gas & Electric Co.* v. *NRDC,* 462 U.S. 87 103 S.Ct. 2246, (1983); *Motor Vehicle Manufacturers Assn.* v. *State Farm Mutual Automobile Insurance Co.,* 463

U.S. 29, 103 S.Ct. 2856 (1983); *International Ladies' Garment Workers' Union* v. *Donovan,* 722 F.2d 795, 232 U.S. App. D.C. 309 (1983), *cert. denied,* 469 U.S. 820 (1984); *Bowen* v. *American Hospital Assn.,* 476 U.S. 610, 106 S.Ct. 2101 (1986).

In developing a health standard, MSHA must also show that modern technology has at least conceived some industrial strategies or devices that are likely to be capable of meeting the standard, and which industry is generally capable of adopting. *United Steelworkers of America* v. *Marshall,* 647 F.2d 1189, 1272 (1980). If only the most technologically advanced companies in an industry are capable of meeting the standard, then that would be sufficient demonstration of feasibility (this would be true even if only some of the operations met the standard for some of the time). *American Iron and Steel Institute* v. *OSHA,* 577 F. 2d 825, (3d Cir. 1978); see also, *Industrial Union Department, AFL–CIO* v. *Hodgson,* 499 F. 2d 467 (1974).

Industry Profile. The industry profile provides background information describing the structure and economic characteristics of the coal mining industry. This information was considered by MSHA in reaching its conclusions about the economic feasibility of various regulatory alternatives.

MSHA divides the mining industry into two major segments based on commodity: (1) coal mines and (2) metal and nonmetal (M/NM) mines. These segments are further divided based on type of operation (*e.g.,* underground mines or surface mines). MSHA maintains its own data on mine type, size, and employment.

MSHA also collects data on the number of independent contractors and contractor employees by major industry segment.

MSHA categorizes mines by size based on employment. For the past 20 years, for rulemaking purposes, MSHA has consistently defined a small mine to be one that employs fewer than 20 workers and a large mine to be one that employs 20 or more workers. To comply with the requirements of the Small Business Regulatory Enforcement Fairness Act (SBREFA) amendments to the Regulatory Flexibility Act (RFA), however, an agency must use the Small Business Administration's (SBA's) criteria for a small entity—for mining, 500 or fewer employees—when determining a rule's economic impact.

Table V–1 presents the total number of small and large coal mines and the corresponding number of miners, excluding contractors, for the coal mining segment. This table uses three mine size categories based on the number of employees: (1) fewer than 20 employees (MSHA's traditional definition of small), (2) 20 to 500 employees (small according to SBA's definition) and (3) more than 500 employees. Table V–1 further disaggregates data by surface mines and underground mines, as well as (for employees) office workers. Table V–2 presents corresponding data on the number of independent contractors and their employees working in the coal mining segment.

Although this particular rulemaking does not apply to the surface coal sector, information about surface coal mines is provided here in order to give context for the discussions on underground mining.

TABLE V–1.—DISTRIBUTION OF COAL MINE OPERATIONS AND EMPLOYMENT (EXCLUDING CONTRACTORS) BY MINE TYPE AND SIZE [a]

Size of coal mine [b]		Mine type			
		Underground	Surface	Office workers	Total coal
Fewer Than 20 Employees	Mines	382	1,058		1,438
	Employees	3,751	6,491	487	10,729
20 to 500 Employees	Mines	522	492		1,014
	Employees	39,566	31,731	3,389	74,692
Over 500 Employees	Mines	6	1		7
	Employees	3,459	510	189	4,158
All Coal Mines	Mines	910	1,549		2,459
	Employees	46,776	38,738	4,065	89,579

[a] Source: U.S. Department of Labor, Mine Safety and Health Administration, Office of Standards, Regulations, and Variances based on 1998 MS data, CM441/CM935LA cycle 1998/198. Data for Total Office workers from Mine Injury and Worktime Quarterly (1997 Closeout Edition) Table 1, p. 5.

[b] Based on MSHA's traditional definition, large mines include all mines with 20 or more employees. Based on SBA's definition, as required by SBREFA, large mines include only mines with over 500 employees.

TABLE V–2.—DISTRIBUTION OF CONTRACTORS AND CONTRACTOR EMPLOYMENT BY SIZE OF OPERATION [a]

Size of contractor [b]		Contractors			
		Underground	Surface	Office workers	Total
Fewer Than 20 Employees	Mines	1,077	2,403		3,480
	Employees	4,078	9,969	1,064	15,111
20 to 500 Employees	Mines	79	242		321
	Employees	4,131	11,618	1,192	16,941
Over 500 Employees	Mines				
	Employees				
Total Contractors	Mines	1,156	2,645		3,801
	Employees	8,209	32,052	2,256	30,052

[a] Source: U.S. Department of Labor, Mine Safety and Health Administration, Office of Standards, Regulations, and Variances based on 1998 MS data, CT441/CT935LA cycle 1998/198. Data for Total Office workers from Mine Injury and Worktime Quarterly (1998 Closeout Edition) Table 5, p. 20.

[b] Based on MSHA's traditional definition, large mines include all mines with 20 or more employees. Based on SBA's definition, as required by SBREFA, large mines include only mines with over 500 employees.

Agency data (Table V–1) indicate that there were about 2,459 coal mines in 1998. When applying MSHA's definition of a small mine (fewer than 20 workers), 1,438 (about 58%) were small mines and 1,021 (about 42%) were large.[82] Using SBA's definition, only 7 coal mines (0.3 percent) were large. These data show that employment at coal mines in 1998 was about 89,600, of which (by MSHA's definition) about 10,700 (12 percent) worked at small mines and 78,900 (88 percent) worked at large mines.[83] Using SBA's definition, 95 percent of coal miners worked at small mines and 5 percent worked at large mines. Using MSHA's definition, small coal mine average 7 employees, and large coal mines average 77 employees. Using SBA's definition, there are, on average, 35 employees in each small coal mine and 594 employees in each large coal mine. MSHA classifies the U.S. coal mining segment into two major commodity groups: bituminous and anthracite. About 92 percent of total coal production is bituminous. The remaining 8 percent is the product of lignite and anthracite mines.[84]

Mines east of the Mississippi accounted for about 49% of coal production in 1998. For the period 1949 through 1998, coal production east of the Mississippi River fluctuated relatively little, from a low of 395 million tons in 1954 to a high of 630 million tons in 1990; 1998 production was estimated at 571 million tons. Coal production west of the Mississippi, by contrast, increased each year from a low of 20 million tons in 1959 to a record high of 548 million tons in 1998.[85] The growth in western coal has been due, in part, to environmental concerns that led to increased demand for low-sulfur coal, which is abundant in the West.

In addition, surface mining, with its higher average productivity, is much more prevalent in the West. Surface mining methods for coal, which include drilling and blasting, are also practiced in surface mines for other commodity types. Most surface mines use front-end loaders, bulldozers, shovels, or trucks for haulage.

The U.S. coal sector produced a record 1.12 billion short tons of coal in 1998, at an average price of $17.58 per ton. The total value of U.S. coal production in 1998 was estimated as $19.7 billion. Small mines (by MSHA's definition) produced about 4 percent (40 million tons) of domestic coal production valued at $0.7 billion, and large mines (by MSHA's definition) produced about 96 percent (1.08 billion tons) valued at $19.0 billion.[86]

The U.S. coal industry enjoys a fairly constant domestic demand. Over 90 percent of U.S. coal demand was accounted for by electric utilities in 1998.[87] Due to the high conversion costs of changing a fuel source, MSHA does not expect a substantial change in coal demand by utility power plants in the near future.[88]

Adequacy of Miner Protection Provided by the Rule for Underground Coal Mines. In evaluating the protection provided by the rule, it should be noted that MSHA has measured dpm concentrations in production areas and haulageways of underground coal mines which exceed 2500_{DPM} μg/m^3 with a mean concentration of 644_{DPM} μg/m^3. See Table III–1 and Figure III–1 in part III of this preamble. As discussed in detail in part III of this preamble, these concentrations place underground coal miners at significant risk of material impairment of their health, and the evidence supports the proposition that reducing the exposure reduces the risk.

The final rule would require operators to limit the emissions of dpm emitted by various categories of equipment in underground coal mines—permissible, heavy duty (and compressors and generators), and other light duty. Equipment added to a mine's inventory more than 60 days after the rule is promulgated (or equipment already in the inventory but equipped with a new engine after that time), would have to comply with the appropriate standard. In addition, operators would have 18 months to bring the existing fleet of permissible diesel equipment into compliance with a 2.5 gr/hr emission standard. Operators would have an additional year (30 months from date of promulgation) to bring the existing fleet of heavy duty equipment (and generators and compressors) into compliance with a 5.0 gr/hr emission standard, and up to 4 years in all to bring that fleet down to a standard of 2.5 gr/hr.

As an example of how these emission standards can reduce dpm concentration levels in a section of an underground coal mine, take the case of a single-section mine with three Ramcars (94hp, indirect injection) and a section airflow of 45,000 cfm. MSHA measured concentrations of dpm in this mine at 610_{DPM} μg/m^3. Of this amount, 25_{DPM} μg/m^3 was coming from the intake to the section, and the remaining 585 $_{DPM}$ μg/m^3 was emitted by the engines. Reducing the engine emissions by 95% through the use of commercially available paper filters would reduce the dpm emitted to 29_{DPM} μg/m^3. With an intake amount of 25_{DPM} μg/m^3, the ambient concentration would be about 54_{DPM} μg/m^3. Similarly, dramatic results can be achieved in almost any situation by adding high efficiency aftertreatment filters or by replacing current engines in the fleet with a more recent generation.

While the reductions in section concentration from the controls required by the final rule can be significant, it is important to recognize that the actual reductions in a section will vary depending upon a number of factors.

In the first place, unlike the proposed rule, the final rule does not require current dpm emissions from each machine to be reduced by 95%. While the existing permissible fleet, and much of the existing heavy duty fleet, will need to reduce engine emissions significantly to come into compliance with the final standard, this will be feasible in many cases with a less efficient filter. A detailed table illustrating by how much the emissions from each current engine in the inventory must be reduced to achieve compliance is shown in table IV–1.

Second, while aftertreatment filters currently available are capable in laboratory tests of achieving a very significant reduction in dpm mass, and this has been confirmed in some field tests, the Agency has not tested filter efficiency under a variety of actual mining conditions. Therefore, actual performance may be different in the field due to individual mining

[82] U.S. Department of Labor, MSHA, 1998 Final MIS data CM441 cycle 1998/198.

[83] U.S. Department of Labor, MSHA, 1998 Final MIS data CM441 cycle 1998/198.

[84] U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 1998*, July 1999, p. 191.

[85] U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 1998*, July 1999, p. 191.

[86] U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 1998*, July 1999, p. 203, U.S. Department of Energy, Energy Information Administration, *Coal Industry Annual 1997*, December 1998, pp. ix and 154, and U.S. Department of Labor, Mine Safety and Health Administration, Division of Mining Information Systems, 1998 Final MIS data (quarter 1–quarter 4) CM441 cycle 1998/198.

[87] U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 1998*, July 1999, p. 187.

[88] U.S. Department of Energy, Energy Information Administration, *Annual Energy Outlook 2000*, p. 68.

conditions (*e.g.,* ventilation changes, changes of the equipment due to maintenance, and the type of engine used).

Third, the impact on a mine section of reduced emissions from a particular machine depends upon the ventilation rate and the ambient dpm intake into the section. If ventilation levels drop below the requirements established to control gaseous emissions, or if many pieces of equipment throughout the mine create a high ambient level of dpm, implementation of the rule may not bring concentrations down as effectively as suggested in the prior example. On the other hand, if the ventilation rate is maintained at a higher level, the emissions would be better diluted and the ambient concentration could offset any decrease in control efficiency under actual mining conditions. The intake of dpm to any section depends on what emissions are upstream. In this regard, it should be noted that the final rule does not require controls on the existing fleet of light-duty equipment, except for generators and compressors; hence, mines with significant light duty equipment will have this exhaust as an ''intake'' in such calculations.

Table V–3 summarizes information from a series of simulations designed to illustrate some of these variables. The simulations were performed using MSHA's ''Estimator''—a computerized spreadsheet designed to calculate dpm ambient levels from given equipment, and the impact of various controls on those ambient levels. (The Estimator was discussed in detail in an Appendix to the preamble to the proposed rule and has since been published (Haney and Saseen, April 2000)). The example simulated here involves a mine section with a 94 horsepower engine, with a 0.3 gm/hp-hr dpm emission rate and a nameplate airflow, 5500 cfm. The engine was operated during an eight hour shift. The Estimator was used to calculate the section concentrations with a paper filter at full laboratory efficiency (95%) and two lower filter efficiencies. The same results would be obtained for multiple pieces of equipment provided that the nameplate airflow is additive for each piece of equipment.

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Table V-3: Section DPM Concentrations for Various Airflow Rates, Afterfilter Efficiencies and Intake DPM Concentrations

Airflow	Intake DPM ($\mu g/m^3$)	Resulting Section DPM Concentration ($\mu g/m^3$)		
		85 Percent	90 Percent	95 Percent
		After-filter	After-filter	After-filter
1.0 x Nameplate Airflow	0	452	302	151
2.0 x Nameplate Airflow	0	226	151	75
3.0 x Nameplate Airflow	0	151	101	50
4.0 x Nameplate Airflow	0	113	75	38
1.0 x Nameplate Airflow	25	477	327	176
2.0 x Nameplate Airflow	25	251	176	100
3.0 x Nameplate Airflow	25	176	126	75
4.0 x Nameplate Airflow	25	138	100	63
1.0 x Nameplate Airflow	50	502	352	201
2.0 x Nameplate Airflow	50	276	201	125
3.0 x Nameplate Airflow	50	201	151	100
4.0 x Nameplate Airflow	50	163	125	88
1.0 x Nameplate	75	527	377	226
2.0 x Nameplate Airflow	75	301	226	150
3.0 x Nameplate Airflow	75	226	176	125
4.0 x Nameplate Airflow	75	188	150	113

* Emission rate - 0.3 gm/hp-hr
Airflow - 5500 cfm

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In Table V–3, the intake dpm (second column) increases after every fourth row. Within each group of four rows, the ventilation (first column) increases

from one row to the next. The last 3 columns display the ambient dpm concentration with a particular filter efficiency.

The first four rows represent a situation where there is no intake dpm. If the mine is ventilated with four times the nameplate airflow (row 4), the ambient dpm concentration using a filter operating at 95% (last column) is reduced to 38_{DPM} μg/m³. If the filter in this situation only works in practice at 85% efficiency in removing dpm, the ambient dpm concentration is only reduced to 113_{DPM} μg/m³. And if the ventilation is reduced to the nameplate airflow (first column) and the filter is only 85% efficient, the ambient dpm climbs to 452_{DPM} μg/m³.

The last four rows display the parallel situation but with an ambient intake concentration to the section of 75_{DPM} μg/m³. In this situation, depending on ventilation and filter effectiveness, the ambient dpm concentration ranges from 113_{DPM} to 527_{DPM} μg/m³.

In the example discussed above—a single section mine with three 94 hp Ramcars—the airflow of 45,000 cfm represents three times the current nameplate requirements. Many underground coal mines may use more than the nameplate ventilation to lower methane concentrations at the face. But if this airflow were reduced to the current nameplate requirements, the ambient dpm would have been 1620_{DPM} μg/m³, and would have been reduced by 95% effective filters to 105_{DPM} μg/m³.

Based on its experience as to the general effects of mining conditions on the expected efficiency of equipment, and on ventilation rates, MSHA has concluded that the rule for this sector will substantially reduce the concentrations of dpm to which underground coal miners are exposed.

Alternatives considered. In order to ensure that the maximum protection that is feasible for the underground mining industry as a whole is provided, the Agency has considered some alternatives. Most are discussed elsewhere in this preamble, but are briefly repeated here and illustrate the extensive thought MSHA gave to this issue.

(1) *Establish a Concentration Limit.* MSHA considered establishing a dpm concentration limit for this sector, as it is doing for underground metal and nonmetal mines. A concentration limit provides operators with flexibility to select any combination of controls that keep ambient dpm concentrations below the limit.

The agency has concluded that it is not yet technologically feasible to establish a dpm concentration limit for underground coal mines. The problem is that significant questions remain as to whether there is a sampling and analytical system that can provide consistent and accurate measurements of dpm in areas of underground coal mines where there is a heavy concentration of coal dust. The Agency is continuing to work on the technical issues involved, and should it determine that these technological problems have been resolved, it will notify the mining community and proceed accordingly.

(2) *95% Filters on Defined Categories of Equipment.* This is what the agency initially proposed for this sector. It has the advantage of ensuring that all controlled equipment is filtered, which some assert is easier to keep in proper shape through observation, and others believe provides more protection against nanoparticles. On the other hand, such an approach may quickly become technologically infeasible as newer, cleaner engines are introduced underground; removing 95% (or any defined percentage) of the lower emissions of these engines is likely to prove much more difficult. Moreover, this approach could act as a disincentive to introduce cleaner engines underground, and thus slow the reduction of dpm that such a replacement fleet might make possible. Finally, the Agency determined that at this time, there is not enough evidence about the risks of nanoparticles to regulate on that basis. Accordingly, the agency rejected this approach in order to avoid the problems associated with its implementation over the long term.

(3) *A machine-based emissions limit with credit for extra ventilation used in the mine.* Under this approach, if the bench test of the combined engine and filter package was conducted at the approval plate ventilation, a mine's use of more than that level of ventilation would be factored into the calculation of what package would be acceptable. So if, for example, an engine equipped with a ceramic filter can reduce emissions to 5.0 grams/hour in a test using the approval plate ventilation, and the mine actually ventilates at twice the name plate ventilation, the system would be deemed to reach 2.5 grams/hour under that circumstance. This alternative, however, is less protective than the rule adopted by the agency, as it would not require dpm emissions to be reduced as much. Accordingly, since the more protective alternative is feasible as well, it would be inappropriate under the law for the agency to adopt this alternative.

(4) *Adjust the Time-Frame for Implementation of the Final Rule.* The final rule will not be fully implemented for several years. The existing permissible fleet is given a full 18 months to comply, even though the agency has determined that there are readily available paper filters which can bring this equipment into compliance. The implementation schedule for the existing heavy duty fleet (and compressors and generators) extends for 4 years from the date of promulgation, even though the agency has concluded that there are hot gas filters readily available which can bring most of this equipment into compliance with the final emissions limit. Accordingly, the agency has considered whether a faster implementation schedule is feasible.

Cutting the 18 month time-frame for permissible equipment does not appear to be practicable for the industry. Eighteen months to obtain and install a relatively new technology is a reasonable time. Time is needed for operators to familiarize themselves with this technology. Also, mine personnel have to be trained in how to maintain control devices in working order. Moreover, MSHA needs time to work with the mining community to develop a revised approach to approving engines for use in permissible equipment in order to accelerate the introduction of a cleaner generation of engines into the permissible fleet.

With respect to the heavy duty fleet, the four years permitted to meet the final emissions limit is actually two years faster than originally proposed by the agency when 95% filters were being proposed. As indicated in section 6 of Part II of this preamble, the development of high efficiency hot gas filters has proceeded much faster than expected, so that it is technologically feasible to comply more quickly with this requirement than originally proposed. Moreover, MSHA has determined that the cost differential to the industry of reaching the final 2.5 micrograms/hour emission limit in 4 years instead of 6 is minor (see REA). However, MSHA has concluded that moving up the timeline further would create unwarranted difficulties for operators in terms of installing the required engines and filters, and accordingly has determined that further acceleration of this schedule would be infeasible.

(5) *Require Machine Emission Limits on all Diesel Equipment in Underground Coal Mines.* The final rule would not immediately apply to more than 60% of the fleet—light-duty equipment other than generators and compressors. Over time, the final rule would have an impact on the remaining light duty fleet through controls on any new equipment introduced underground, but it will take

many years before mine workers get the benefits of this approach. By contrast, the Commonwealth of Pennsylvania has recently adopted legislation for universal high-efficiency filtration based on an agreement in the mining community of that state. The Pennsylvania law requires that all diesel-powered equipment introduced into underground coal mines in that state (essentially all equipment, given the past ban), meet an emissions limit requirement (as well as a separate filter requirement).

One reason asserted for not covering all light duty equipment is that this equipment may run only intermittently, and under light loads, hence producing less dpm than other kinds of equipment. This proposition was supported by industry representatives during the rulemaking, and disputed by miners during the rulemaking proceedings. The Agency has not been able to draw any conclusions based on the mixed evidence as to the light duty fleet as a whole; as noted previously, it has carved out the 3% of the light duty fleet that clearly works like heavy duty equipment, and is covering them in this rule (generators and compressors).

A second issue is costs. The Agency decided to consider what it would take to bring the rest of the industry up to the standard established under the Pennsylvania agreement of universal coverage. MSHA has calculated that such a requirement would cost the underground coal industry an additional $9.7 to $17.4 million a year. This would be an increase of 135–240% of the cost of the rule for the underground coal mining industry. Since drawing conclusions concerning the level of dpm actually produced by light duty equipment in underground coal mines is difficult, the Agency has decided to take the approach of phasing in emission controls for light duty outby equipment over a period of five years. This approach significantly reduces the cost of the rule. Eventually, dpm exposures will be reduced for all miners in all areas of the mine.

(6) *Requiring certain engines to meet defined particulate emission standards.* As discussed in part II of this preamble, the Mine Safety and Health Advisory Committee on Standards and Regulations for Diesel-Powered Equipment in Underground Coal Mines recommended the establishment of a particulate index (PI), and MSHA did so in its diesel equipment rule. Under that rule, the PI establishes the amount of air required to dilute the dpm produced by an engine (as determined during its approval test under subpart E of part 7) to 1000 $\mu g/m^3$.

In the preamble of the diesel equipment rule, MSHA noted that mine operators and machine manufacturers would find it useful to consider the engine PI in selecting and purchasing decisions. The agency explicitly deferred until this rulemaking the question of whether to require engines used in mining environments to meet a particular PI.

In its final rule, the Agency is, in fact, using a significant portion of the concepts embodied in the particulate index. The determination of the quantity of dpm emitted from the machine is based on the information from the engine approval tests in 30 CFR 7.89 as was used to establish the particulate index. Both means of expressing the dpm characteristics of the machine begin with determining the total amount of dpm, expressed in grams/hour, produced by the engine over the test cycle described in ISO 8178. The particulate index is determined by calculating the quantity of air required to dilute that particulate to a concentration of 1 mg/m^3. The quantity of dpm emitted from the machine is determined by multiplying the quantity of dpm emitted from the engine by the filtration efficiency of the aftertreatment device.

Had the agency been able to utilize a concentration limit in this sector, the particulate index could have been used directly to compute an estimated level of dpm that could be achieved with various quantities of ventilation air. As noted above, however, that approach was found to be infeasible.

Feasibility of final rule for underground coal mining sector. The Agency has carefully considered both the technological and economic feasibility of the rule for the underground coal mining sector as a whole.

Although some doubts were expressed about this during the rulemaking proceedings, it is clear now that the technology exists to implement the final rule's requirements. As this preamble explains in overview in section 6 of Part II, and reiterates in connection with the specific requirements of the rule in Part IV, there are available emission controls which can bring all existing and contemplated future diesel equipment into compliance with the requirements of the rule. Paper filters have now been verified to reduce emissions from the dirtiest permissible engines to the required limit of 2.5 grams per hour. Ceramic filters have been certified by VERT to have the efficiency required to reduce emissions from the dirtiest heavy duty engines to the interim limit of 5.0 grams/hour, and for all but one engine to the final limit of 2.5 grams/hour. Approved engines that meet the emissions limit for newly introduced light duty equipment are available for all categories. And as MSHA and the mining industry work together to address aspects of the approval process that may be inhibiting the introduction of the newer generations of engines into underground mines, there should be no technological nor practical barriers to further emission limit reductions.

The economic feasibility of this rule has also been carefully considered by MSHA. The total for the final rule for underground coal mines will be about $7 million per year. The costs per dieselized mine are expected to be about $48,000 a year. MSHA has calculated that the costs of the final rule amount to less than one-quarter of one percent (0.23 percent) of the annual revenues of the dieselized underground coal mining sector. (The methodology for this calculation is discussed in Chapter IV of the Agency's REA). After reviewing the economic profile of that sector, and taking into account the cost of implementing the related diesel equipment rule, MSHA has concluded that the rule is economically feasible for this sector as a whole.

Conclusion: Underground Coal Mines. Based on the best evidence available to it at this time, the Agency has concluded that the final rule for the underground coal sector meets the statutory requirement that it attain the highest degree of health and safety protection for the miners in that sector, with feasibility a consideration.

VI. Regulatory Impact Analyses

This part of the preamble reviews several impact analyses which the Agency is required to provide in connection with its final rulemaking. The full text of these analyses can be found in the Agency's Regulatory Economic Analysis (REA).

(A) Costs and Benefits: Executive Order 12866

In accordance with Executive Order 12866, MSHA has prepared a Regulatory Economic Analysis (REA) of the estimated costs and benefits associated with the final rule for the underground coal sector.

The key conclusions of the REA are summarized, together with cost tables, in part I of this preamble (see Item number 7). The complete REA is part of the record of this rulemaking, and is available from MSHA.

The Agency considers this rulemaking ''significant'' under section 3(f) of Executive Order 12866, and has so

designated the rule in its semiannual regulatory agenda (RIN 1219–AA74). However, based upon the REA, MSHA has determined that the final rule does not constitute an ''economically significant'' regulatory action pursuant to section 3(f)(1) of Executive Order 12866.

(B) Regulatory Flexibility Certification.

The Regulatory Flexibility Act (RFA) requires regulatory agencies to consider a rule's economic impact on small entities. Under the RFA, MSHA must use the Small Business Administration's (SBA's) criterion for a small entity in determining a rule's economic impact unless, after consultation with the SBA Office of Advocacy, MSHA establishes an alternative definition for a small mine and publishes that definition in the **Federal Register** for notice and comment. For the mining industry, SBA defines ''small'' as a mine with 500 or fewer workers. MSHA traditionally has considered small mines to be those with fewer than 20 workers. To ensure that the final rule conforms with the RFA, MSHA has analyzed the economic impact of the final rule on mines with 500 or fewer workers (as well as on those with fewer than 20 workers).

MSHA has determined that the final rule would not have a significant economic impact on small mines, whether a small mine is defined as one with 500 or fewer workers or one with fewer than 20 workers.

Using the Agency's traditional definition of a small mine, which is one employing fewer than 20 workers, the estimated yearly cost of the final rule on small underground coal mines will be about $7,400. This estimated annualized cost for small mines compares to estimated annual revenues of approximately $9.1 million for the class of small underground coal mines.

Using SBA's definition of a small mine, which is one employing 500 or fewer workers, the estimated yearly cost of the final rule for all small underground coal mines would be about $6.1 million. This estimated cost for small mines compares to estimated annual revenues of approximately $2.95 billion for small underground coal mines, using SBA's criteria.

Based on its analysis, MSHA has determined that the final rule would not have a significant economic impact on a substantial number of small mines. MSHA has so certified these findings to the Small Business Administration. The factual basis for this certification is discussed in Chapter V of the REA for this rule.

(C) Unfunded Mandates Reform Act of 1995

For purposes of the Unfunded Mandates Reform Act of 1995, the final rule does not include any Federal mandate that may result in increased expenditures by State, local, or tribal governments, or increased expenditures by the private sector of more than $100 million.

(D) Paperwork Reduction Act of 1995

The final rule contains information collections which are subject to review by the Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1995 (PRA95). The final rule will impose paperwork burden hours on underground coal mine operators that use diesel powered equipment and on manufacturers of diesel powered equipment. For mine operators that use diesel powered equipment, the final rule imposes two types of burden hours. First, there are burden hours that will occur *only* in the first year the rule is in effect (hereafter known as first year burden hours). Second, there are burden hours that will occur *every* year that the rule is in effect, starting with the first year (hereafter known as ''annual'' burden hours). Manufacturers of diesel equipment that are affected by this rule, will incur only first year burden hours.

Mine Operators

First Year Burden Hours

In the first year that the rule takes effect, mine operators will incur 997 burden hours, which is composed of 349 first year burden hours (from Table VI–1) and 648 annual burden hours (from Table VI–1(a)). The related costs to mine operators will be $33,049, of which $12,627 is related to first year burden hours (from Table VI–1) and $20,422 is related to annual burden hours (from Table VI–1(a)).

Burden Hours After the First Year

Beginning in the second year the rule takes effect and continuing every year thereafter, mine operators will incur 648 burden hours and related costs of $20,422 (from Table VI–1(a)).

Manufacturers

First Year Burden Hours

In the first year that the rule is in effect, manufacturers will incur 700 burden hours and related costs of $35,000 (from Table VI–2). After the first year, manufacturers will not incur any burden hours or related costs.

TABLE VI–1.—MINE OPERATORS—FIRST YEAR BURDEN HOURS

Detail	<20 emp.		20 to 500 emp.		>500 emp.		Total	
	Hrs.	Costs	Hrs.	Costs	Hrs.	Costs	Hrs.	Costs
75.1915/72.503	1.0	$28	50	$1,299	1.0	$14	52	$1,341
72.510	0.6	29	11	568	0.1	4	12	602
72.520	9.0	399	267	10,027	9.0	257	285	10,684
Total	11.0	456	329	11,895	10.0	276	349	12,627

TABLE VI–1(a).—MINE OPERATORS—ANNUAL BURDEN HOURS

Detail	<20 emp.		20 to 500 emp.		>500 emp.		Total	
	Hrs.	Costs	Hrs.	Costs	Hrs.	Costs	Hrs.	Costs
72.510	5.0	$167	563	$17,971	28.0	$922	597	$19,061
72.1915/72.503	0	0	4	76	0.3	5	4	82
72.520	0.3	8	43	1,177	3.5	94	47	1,279
Total	5.0	176	610	19,225	32.0	1,021	648	20,422

TABLE VI–2.—MANUFACTURERS—ANNUAL BURDEN HOURS

Detail	Hrs.	Costs
Amended Applications	700	$35,000

The paperwork provisions for the proposed rule were approved under OMB Control Number 1219–0124. Our paperwork submission summarized above is explained in detail in the final REA. The REA includes the estimated costs and assumptions for each final paperwork requirement related to this final rule. A copy of the REA is available from us. This final rule is being submitted to OMB under the same control number. Respondents are not required to respond to any collection of information unless it displays a current valid OMB control number.

(E) National Environmental Protection Act

The National Environmental Policy Act (NEPA) of 1969 requires each Federal agency to consider the environmental effects of final actions and to prepare an Environmental Impact Statement on major actions significantly affecting the quality of the environment. MSHA has reviewed the final rule in accordance with NEPA requirements (42 U.S.C. 4321 *et seq.*), the regulations of the Council of Environmental Quality (40 CFR Part 1500), and the Department of Labor's NEPA procedures (29 CFR Part 11). As a result of this review, MSHA has determined that this rule will have no significant environmental impact.

(F) Executive Order 12360 Governmental Actions and Interference With Constitutionally Protected Property Rights

This final rule is not subject to Executive Order 12360, Governmental Actions and Interference with Constitutionally Protected Property Rights, because it does not involve implementation of a policy with takings implications.

(G) Executive Order 13045 Protection of Children from Environmental Health Risks and Safety Risks

In accordance with Executive Order 13045, MSHA has evaluated the environmental health and safety effects of the final rule on children. The Agency has determined that the rule will not have an adverse impact on children.

(H) Executive Order 12988 Civil Justice Reform

The Agency has reviewed Executive Order 12988, Civil Justice Reform, and determined that the final rule will not unduly burden the Federal court system. The rule has been written so as to provide a clear legal standard for affected conduct, and has been reviewed carefully to eliminate drafting errors and ambiguities.

(I) Executive Order 13084 Consultation and Coordination with Indian Tribal Governments

MSHA certifies that the final rule will not impose substantial direct compliance costs on Indian tribal governments.

(J) Executive Order 13132 Federalism

MSHA has reviewed the final rule in accordance with Executive Order 13132 regarding federalism and has determined that it does not have ''federalism implications.'' The final rule does not ''have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.''

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Supplementary References

Below is a list of supplemental references that MSHA reviewed and considered in the development of the proposed rule. These documents are not specifically cited in the preamble discussion, but are applicable to MSHA's findings:

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List of Subjects in 30 CFR Part 72

Coal, Health standards, Mine safety and health, Underground mines, Diesel particulate matter.

Dated: January 8, 2001.

Robert A. Elam,

Acting Assistant Secretary for Mine Safety and Health.

Chapter I of Title 30 of the Code of Federal Regulations is hereby amended as follows:

PART 72—[AMENDED]

1. The authority citation for Part 72 continues to read as follows:

Authority: 30 U.S.C. 811, 813(h), 957, 961.

2. Part 72 is amended by adding Subpart D to read as follows:

Subpart D—Diesel Particulate Matter—Underground Areas of Underground Coal Mines

Subpart D—Diesel Particulate Matter—Underground Areas of Underground Coal Mines

§ 72.500 Emission limits for permissible diesel-powered equipment.

(a) Each piece of permissible diesel-powered equipment introduced into an underground area of an underground coal mine after March 20, 2001 must not emit no more than 2.5 grams per hour of diesel particulate matter.

(b) As of July 19, 2002, each piece of permissible diesel-powered equipment operated in an underground area of an underground coal mine must not emit no more than 2.5 grams per hour of diesel particulate matter.

§ 72.501 Emission limits for nonpermissible heavy-duty diesel-powered equipment, generators and compressors.

(a) Each piece of nonpermissible heavy-duty diesel-powered equipment (as defined by § 75.1908(a) of this part), generator or compressor introduced into an underground area of an underground coal mine after March 20, 2001 must not emit no more than 5.0 grams per hour of diesel particulate matter.

(b) As of July 21, 2003, each piece of nonpermissible heavy-duty diesel-powered equipment (as defined by § 75.1908(a) of this part), generator or compressor operated in an underground area of an underground coal mine must not emit no more than 5.0 grams per hour of diesel particulate matter.

(c) As of January 19, 2005, each piece of nonpermissible heavy-duty diesel-powered equipment (as defined by § 75.1908(a) of this part), generator or compressor operated in an underground area of an underground coal mine must not emit no more than 2.5 grams per hour of diesel particulate matter.

(d) Notwithstanding the other provisions of this section, a generator or compressor that discharges its exhaust directly into intake air that is coursed directly to a return air course, or discharges its exhaust directly into a return air course, is not subject to the applicable requirements of this section.

§ 72.502 Requirements for nonpermissible light-duty diesel-powered equipment other than generators and compressors.

(a) Each piece of nonpermissible light-duty diesel-powered equipment (as defined by § 75.1908(b) of this part), other than generators and compressors, introduced into an underground area of an underground coal mine after March 20, 2001 must not emit no more than 5.0 grams per hour of diesel particulate matter.

(b) A piece of nonpermissible light-duty diesel-powered equipment must be deemed to be in compliance with the requirements of paragraph (a) of this section if it utilizes an engine which meets or exceeds the applicable particulate matter emission requirements of the Environmental Protection Administration listed in Table 72.502–1, as follows:

TABLE 72.502–1

EPA requirement	EPA category	PM limit
40 CFR 86.094–8(a)(1)(I)(A)(2)	light duty vehicle	0.1 g/mile.
40 CFR 86.094–9(a)(1)(I)(A)(2)	light duty truck	0.1 g/mile.
40 CFR 86.094–11(a)(1)(iv)(B)	heavy duty highway engine	0.1 g/bhp-hr.
40 CFR 89.112(a)	Tier 2 nonroad	Varies by power:
	kW< (hp<11)	0.80 g/kW-hr (0.60 g/bhp-hr).
	8≤kW<19 (11≤hp<25)	0.80 g/kW-hr (0.60 g/bhp-hr).
	19≤kW<37 (25≤hp<50)	0.60 g/kW-hr (0.45 g/bhp-hr).
	37≤kW<75 (50≤hp<100)	0.40 g/kW-hr (0.30 g/bhp-hr).
	75≤kW<130 (100≤hp<175)	0.30 g/kW-hr (0.22 g/bhp-hr).
	130≤kW<225 (175≤hp<300)	0.20 g/kW-hr (0.15 g/bhp-hr).
	225≤kW<450 (300≤hp<600)	0.20 g/kW-hr (0.15 g/bhp-hr).

Notes: ''g'' means grams; ''kW'' means kilowatt; ''hp'' means horsepower; ''g/kW-hr'' means grams/kilowatt-hour; ''g/bhp-hr'' means grams/brake horsepower-hour.

(c) The requirements of this section do not apply to any diesel-powered ambulance or fire fighting equipment that is being used in accordance with the mine fire fighting and evacuation plan under § 75.1101–23.

§ 72.503 Determination of emissions; filter maintenance; definition of ''introduced''.

(a) MSHA will determine compliance with the emission requirements established by this part by using the amount of diesel particulate matter emitted by a particular engine determined from the engine approval pursuant to § 7.89(a)(9)(iii)(B) or § 7.89(a)(9)(iv)(A) of this title, with the exception of engines deemed to be in compliance by meeting the EPA requirements specified in Table 72.502–1 (§ 72.502(b)).

(b) Except as provided in paragraph (c) of this section, the amount by which an aftertreatment device can reduce engine emissions of diesel particulate matter as determined pursuant to paragraph (a) must be established by a laboratory test:

(1) on an approved engine which MSHA has determined, pursuant to paragraph (a) of this section, to emit no more diesel particulate matter than the engine being used in the piece of diesel-powered equipment in question;

(2) using the test cycle specified in Table E–3 of § 7.89 of this title, and following a test procedure appropriate for the filtration system, by a laboratory capable of testing engines in accordance with the requirements of Subpart E of part 7 of this title; and

(3) with an aftertreatment device representative of that being used on the piece of diesel-powered equipment in question.

(c) In lieu of the laboratory tests required by paragraph (b), the Secretary may accept the results of tests conducted or certified by an organization whose testing standards are deemed by the Secretary to be as rigorous as those set forth by paragraph (b) of this section; and further, the Secretary may accept the results of tests for one aftertreatment device as evidencing the efficiency of another aftertreatment device which the Secretary determines to be essentially identical to the one tested.

(d) Operators must maintain in accordance with manufacturer specifications and free of observable defects, any aftertreatment device installed on a piece of diesel equipment upon which the operator relies to remove diesel particulate matter from diesel emissions.

(e) For purposes of §§ 72.500(a), 72.501(a) and 72.502(a), the term ''introduced'' means any piece of equipment whose engine is a new addition to the underground inventory of engines of the mine in question, including newly purchased equipment, used equipment, and equipment receiving a replacement engine that has a different serial number than the engine it is replacing. ''Introduced'' does not include a piece of equipment whose engine was previously part of the mine inventory and rebuilt.

§ 72.510 Miner health training.

(a) Operators must provide annual training to all miners at a mine who can reasonably be expected to be exposed to diesel emissions on that property. The training must include—

(1) The health risks associated with exposure to diesel particulate matter;

(2) The methods used in the mine to control diesel particulate matter concentrations;

(3) Identification of the personnel responsible for maintaining those controls; and

(4) Actions miners must take to ensure the controls operate as intended.

(b)(1) An operator must keep a record of the training at the mine site for one year after completion of the training. An

operator may keep the record elsewhere if the record is immediately accessible from the mine site by electronic transmission.

(2) Upon request from an authorized representative of the Secretary of Labor, the Secretary of Health and Human Services, or from the authorized representative of miners, mine operators must promptly provide access to any such training record. Whenever an operator ceases to do business, that operator must transfer the training records, or a copy, to any successor operator who must maintain them for the required period.

§ 72.520 Diesel equipment inventory.

(a) The operator of each mine that utilizes diesel equipment underground, shall prepare and submit in writing to the District Manager, an inventory of diesel equipment used in the mine. The inventory shall include the number and type of diesel-powered units used underground, including make and model of unit, type of equipment, make and model of engine, serial number of engine, brake horsepower rating of engine, emissions of engine in grams per hour or grams per brake horsepower-hour, approval number of engine, make and model of aftertreatment device, serial number of aftertreatment device if available, and efficiency of aftertreatment device.

(b) The mine operator shall make changes to the diesel equipment inventory as equipment or emission control systems are added, deleted or modified and submit revisions, to the District Manager, within 7 calendar days.

(c) If requested, the mine operator shall provide a copy of the diesel equipment inventory to the representative of the miners within 3 days of the request.

[FR Doc. 01–995 Filed 1–18–01; 8:45 am]

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DEPARTMENT OF LABOR

Mine Safety and Health Administration

30 CFR Part 57

RIN 1219–AB11

Diesel Particulate Matter Exposure of Underground Metal and Nonmetal Miners

AGENCY: Mine Safety and Health Administration (MSHA), Labor.

ACTION: Final rule.

SUMMARY: This rule establishes new health standards for underground metal and nonmetal mines that use equipment powered by diesel engines.

This rule is designed to reduce the risks to underground metal and nonmetal miners of serious health hazards that are associated with exposure to high concentrations of diesel particulate matter (dpm). DPM is a very small particle in diesel exhaust. Underground miners are exposed to far higher concentrations of this fine particulate than any other group of workers. The best available evidence indicates that such high exposures put these miners at excess risk of a variety of adverse health effects, including lung cancer.

The final rule for underground metal and nonmetal mines would establish a concentration limit for dpm, and require mine operators to use engineering and work practice controls to reduce dpm to that limit. Underground metal and nonmetal mine operators would also be required to implement certain ''best practice'' work controls similar to those already required of underground coal mine operators under MSHA's 1996 diesel equipment rule. These operators would also be required to train miners about the hazards of dpm exposure.

By separate notice, MSHA has published a rule to reduce dpm exposures in underground coal mines.

DATES: The provisions of the final rule are effective March 20, 2001. However, §57.5060 (a) will not apply until July 19, 2002 and §57.5060 (b) will not apply until January 19, 2006.

FOR FURTHER INFORMATION CONTACT: David L. Meyer, Director, Office of Standards, Regulations, and Variances, MSHA, 4015 Wilson Boulevard, Arlington, VA 22203–1984. Mr. Meyer can be reached at dmeyer@msha.gov (Internet E-mail), 703–235–1910 (voice), or 703–235–5551 (fax). You may obtain copies of the final rule in alternative formats by calling this number. The alternative formats available are either a large print version of the final rule or the final rule in an electronic file on computer disk. The final rule also is available on the Internet at http://www.msha.gov/REGSINFO.HTM.

SUPPLEMENTARY INFORMATION:

I. Overview of the Final Rule

This Part: (1) Summarizes the key provisions of the final rule; and (2) summarizes MSHA's responses to some of the fundamental questions raised during the rulemaking proceeding—the need for the rule, the ability of the agency to accurately measure diesel particulate matter (dpm) in underground metal and nonmetal mine environments, and the feasibility of the requirements for this sector of the mining industry.

(1) Summary of Key Provisions of the Final Rule

The final rule applies only to underground areas of underground metal and nonmetal mines.

The final rule requires operators: (A) To observe a concentration limit where miners normally work or travel by the application of engineering controls, with certain limited exceptions, compliance with which will be determined by MSHA sampling; (B) to observe a set of best practices to minimize dpm generation; (C) to limit engines newly introduced underground to those meeting basic emissions standards; (D) to provide annual training to miners on dpm hazards and controls; and (E) to conduct sampling as often as necessary to effectively evaluate dpm concentrations at the mine. A list of effective dates for the provisions of the rule follows this summary.

(A) Observe a limit on the concentration of dpm in all areas of an underground metal or nonmetal mine where miners work or travel, with certain specific exceptions. The rule would limit dpm concentrations to which miners are exposed to about 200 micrograms per cubic meter of air—expressed as 200_{DPM} $\mu g/m^3$. However, the rule expresses the limit so as to reflect the measurement method MSHA will be using for compliance purposes to determine dpm concentrations. That method is specified in the rule itself. As discussed in detail in response to Question 2, the method analyzes a dust sample to determine the amount of total carbon present. Total carbon comprises 80–85% of the dpm emitted by diesel engines. Accordingly, using the lower boundary of 80%, a concentration limit of 200_{DPM} $\mu g/m^3$ can be achieved by restricting total carbon to 160_{TC} $\mu g/m^3$. This is the way the standard is expressed:

> After January 19, 2006 any mine operator covered by this part shall limit the concentration of diesel particulate matter to which miners are exposed in underground areas of a mine by restricting the average eight-hour equivalent full shift airborne concentration of total carbon, where miners normally work or travel, to 160 micrograms per cubic meter of air (160_{TC} $\mu g/m^3$).

All underground metal and nonmetal mines would be given a full five years to meet this limit, which is referred to in this preamble as the ''final'' concentration limit. However, starting July 19, 2002, underground metal and nonmetal mines have to observe an ''interim'' dpm concentration limit—expressed as a restriction on the